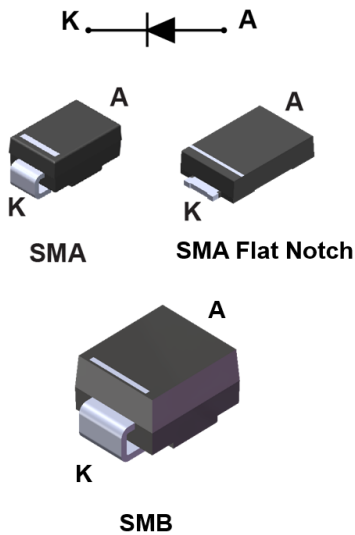


## 60 V, 1 A power Schottky rectifier



### Features

- Very small conduction losses
- Negligible switching losses
- Low forward voltage drop
- Surface mount miniature packages
- Avalanche capability specified
- [ECOPACK2](#) compliant

### Applications

- Lighting
- Battery charger
- DC / DC converter
- Notebook adapter
- Switching diode

### Description

Single Schottky rectifiers designed for high frequency miniature switched mode power supplies such as adaptors and on board DC/DC converters.

Packaged in SMA, SMA Flat Notch or SMB, the [STPS160](#) is ideal for use in parallel with MOSFETs in synchronous and low voltage secondary rectification.

| Product status          |        |
|-------------------------|--------|
| <a href="#">STPS160</a> |        |
| Product summary         |        |
| Symbol                  | Value  |
| $I_{F(AV)}$             | 1 A    |
| $V_{RRM}$               | 60 V   |
| $T_{j(max.)}$           | 150 °C |
| $V_{F(typ.)}$           | 0.49 V |

# 1 Characteristics

**Table 1. Absolute ratings (limiting values at 25 °C, unless otherwise specified)**

| Symbol             | Parameter                                             |                     |                                                 | Value       | Unit |
|--------------------|-------------------------------------------------------|---------------------|-------------------------------------------------|-------------|------|
| V <sub>RRM</sub>   | Repetitive peak reverse voltage                       |                     |                                                 | 60          | V    |
| I <sub>F(AV)</sub> | Average forward current, δ = 0.5, square wave         | SMA                 | T <sub>L</sub> = 130 °C                         | 1           | A    |
|                    |                                                       | SMA Flat Notch, SMB | T <sub>L</sub> = 135 °C                         |             |      |
| I <sub>FSM</sub>   | Surge non repetitive forward current                  | SMA, SMB            | t <sub>p</sub> = 10 ms sinusoidal               | 75          | A    |
|                    |                                                       | SMA Flat Notch      |                                                 | 100         |      |
| P <sub>ARM</sub>   | Repetitive peak avalanche power                       |                     | t <sub>p</sub> = 10 μs, T <sub>j</sub> = 125 °C | 180         | W    |
| T <sub>stg</sub>   | Storage temperature range                             |                     |                                                 | -65 to +150 | °C   |
| T <sub>j</sub>     | Maximum operating junction temperature <sup>(1)</sup> |                     |                                                 | +150        | °C   |

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

**Table 2. Thermal resistance parameter**

| Symbol        | Parameter        |                | Max. value | Unit |
|---------------|------------------|----------------|------------|------|
| $R_{th(j-l)}$ | Junction to lead | SMA            | 30         | °C/W |
|               |                  | SMA Flat Notch | 20         |      |
|               |                  | SMB            | 23         |      |

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 | $T_j = 25\text{ °C}$  | $V_R = V_{RRM}$    | -    |      | 4    | $\mu\text{A}$ |
|             |                         | $T_j = 125\text{ °C}$ |                    | -    | 1.1  | 4    | mA            |
| $V_F^{(2)}$ | Forward voltage drop    | $T_j = 25\text{ °C}$  | $I_F = 1\text{ A}$ | -    |      | 0.67 | V             |
|             |                         | $T_j = 125\text{ °C}$ |                    | -    | 0.49 | 0.57 |               |
|             |                         | $T_j = 25\text{ °C}$  | $I_F = 2\text{ A}$ | -    |      | 0.8  |               |
|             |                         | $T_j = 125\text{ °C}$ |                    | -    | 0.58 | 0.65 |               |

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:

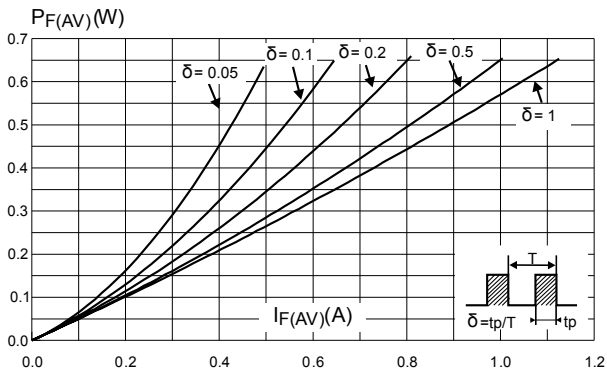
$$P = 0.49 \times I_{F(AV)} + 0.08 \times I_F^2(RMS)$$

For more information, please refer to the following application notes related to the power losses :

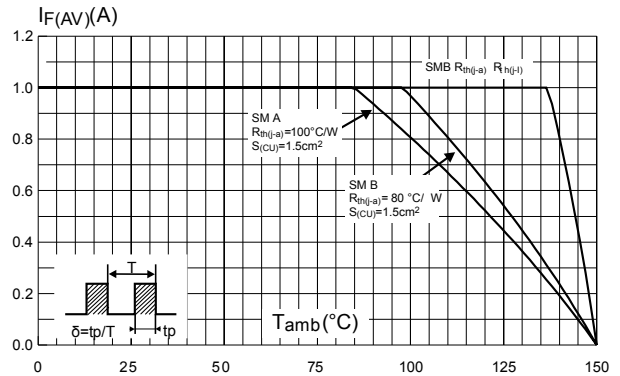
- AN604: Calculation of conduction losses in a power rectifier
- AN4021: Calculation of reverse losses on a power diode

## 1.1 Characteristics (curves)

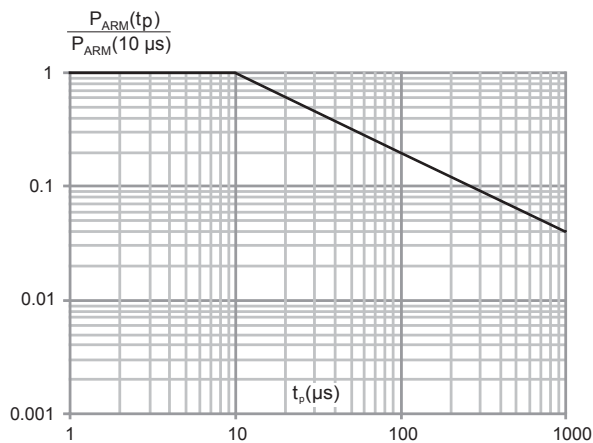
**Figure 1. Average forward power dissipation versus average forward current**



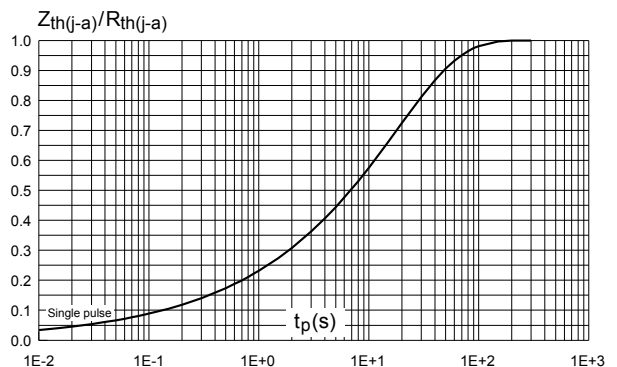
**Figure 2. Average forward current versus ambient temperature ( $\delta = 0.5$ )**



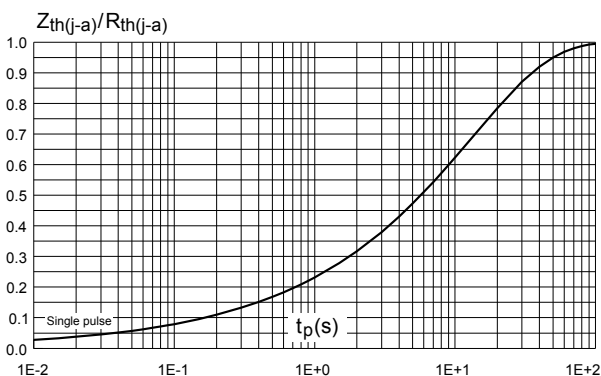
**Figure 3. Normalized avalanche power derating versus pulse duration ( $T_j = 125^\circ\text{C}$ )**



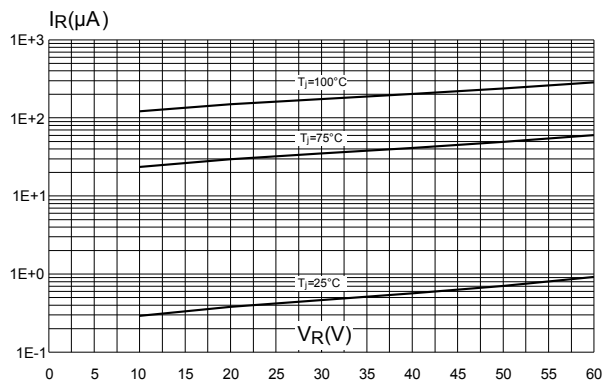
**Figure 4. Relative variation of thermal impedance junction to ambient versus pulse duration (SMB)**



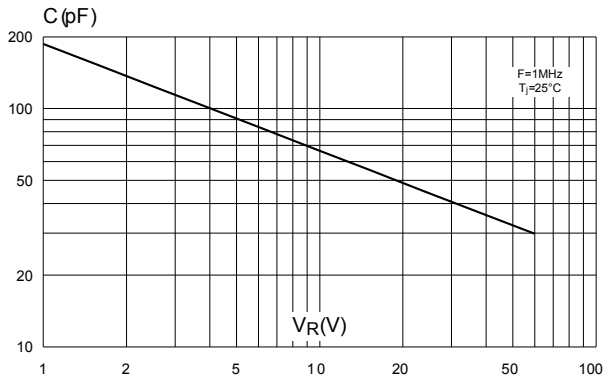
**Figure 5. Relative variation of thermal impedance junction to ambient versus pulse duration (SMA)**



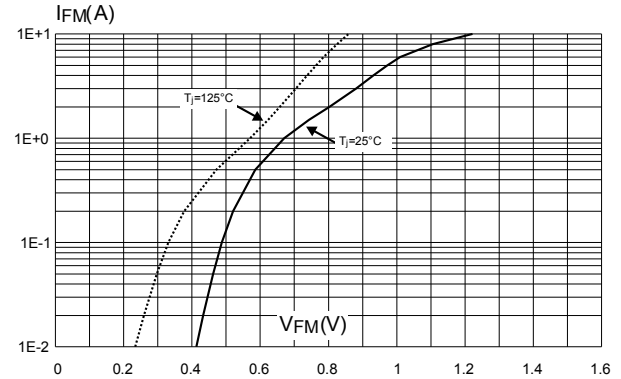
**Figure 6. Reverse leakage current versus reverse voltage applied (typical values)**



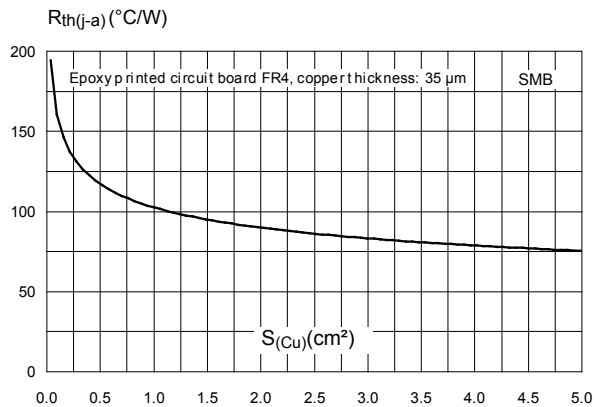
**Figure 7. Junction capacitance versus reverse voltage applied (typical values)**



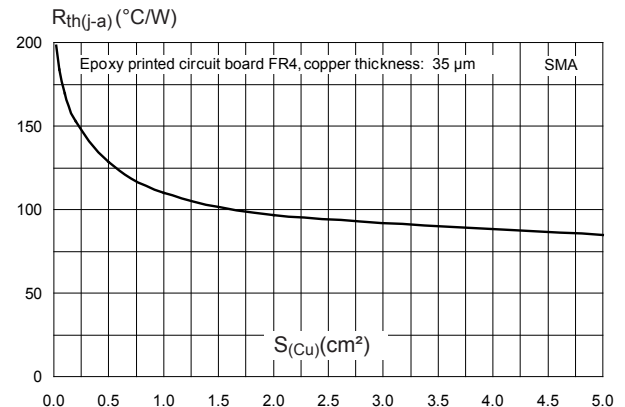
**Figure 8. Forward voltage drop versus forward current (maximum values)**



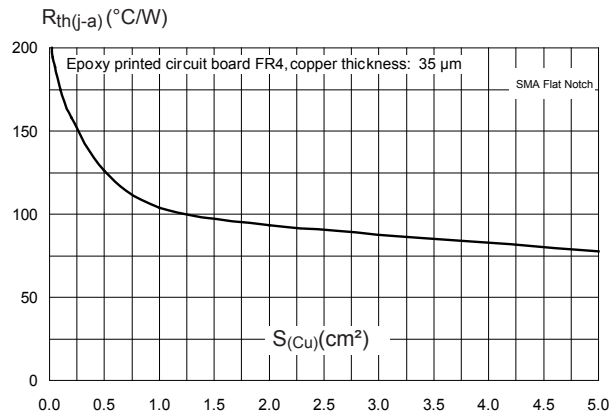
**Figure 9. Thermal resistance junction to ambient versus copper surface under each lead (SMB)**



**Figure 10. Thermal resistance junction to ambient versus copper surface under each lead (SMA)**



**Figure 11. Thermal resistance junction to ambient versus copper surface under each lead (SMA Flat Notch)**



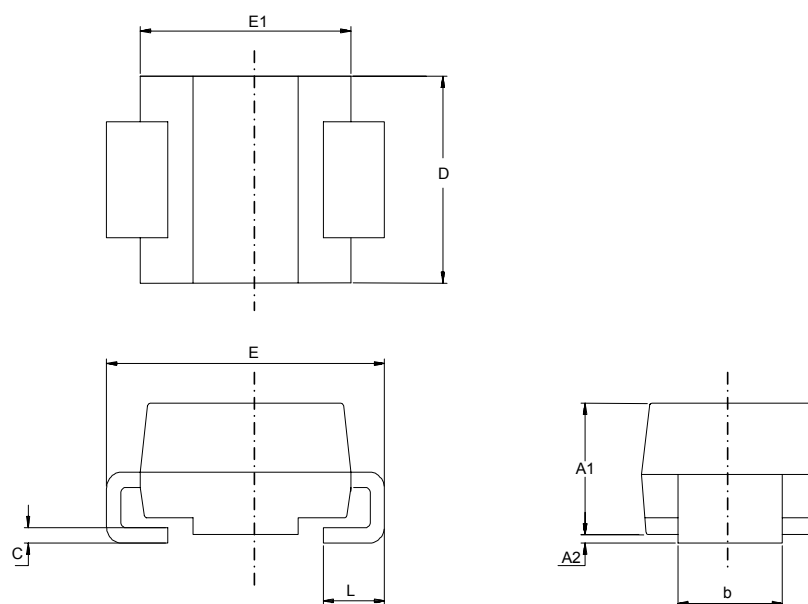
## 2 Package information

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](http://www.st.com). ECOPACK is an ST trademark.

### 2.1 SMA package information

- Epoxy meets UL94, V0
- Cooling method : by conduction (C)

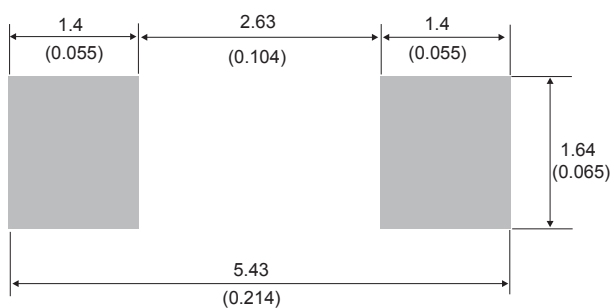
**Figure 12. SMA package outline**



**Table 4. SMA package mechanical data**

| Ref. | Dimensions  |      |                             |       |
|------|-------------|------|-----------------------------|-------|
|      | Millimeters |      | Inches (for reference only) |       |
|      | Min.        | Max. | Min.                        | Max.  |
| A1   | 1.90        | 2.45 | 0.074                       | 0.097 |
| A2   | 0.05        | 0.20 | 0.001                       | 0.008 |
| b    | 1.25        | 1.65 | 0.049                       | 0.065 |
| c    | 0.15        | 0.40 | 0.005                       | 0.016 |
| D    | 2.25        | 2.90 | 0.088                       | 0.115 |
| E    | 4.80        | 5.35 | 0.188                       | 0.211 |
| E1   | 3.95        | 4.60 | 0.155                       | 0.182 |
| L    | 0.75        | 1.50 | 0.029                       | 0.060 |

**Figure 13. SMA recommended footprint in mm (inches)**



## 2.2 SMA Flat Notch package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Band indicates cathode

Figure 14. SMA Flat Notch package outline

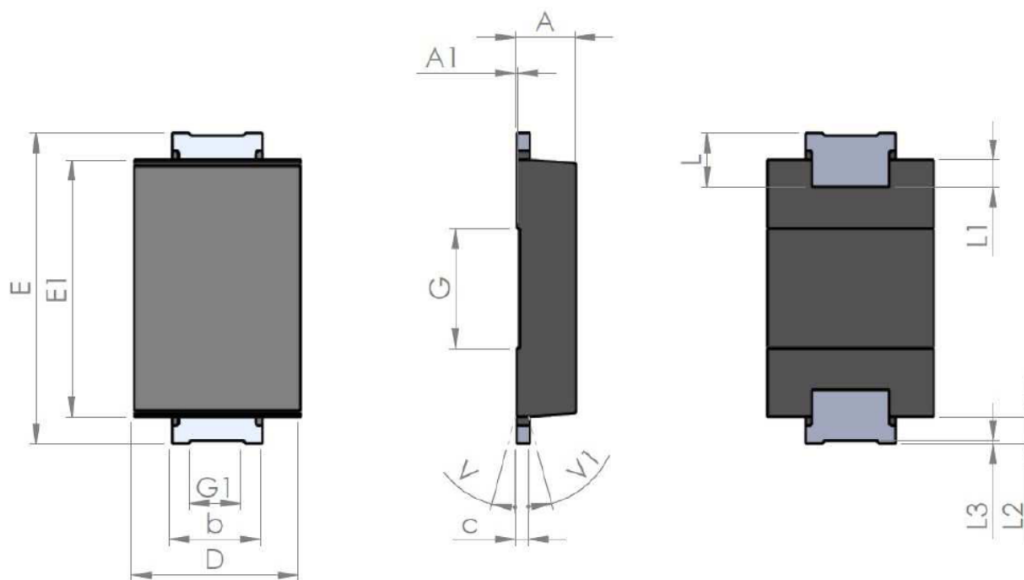
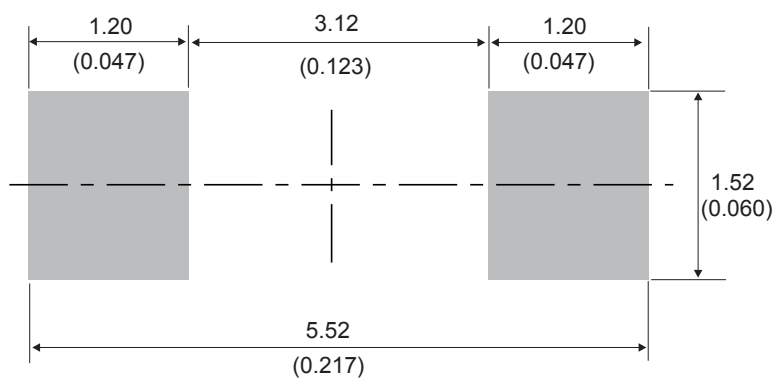


Table 5. SMA Flat Notch package mechanical data

| Ref. | Dimensions  |      |      |                             |       |       |
|------|-------------|------|------|-----------------------------|-------|-------|
|      | Millimeters |      |      | Inches (for reference only) |       |       |
|      | Min.        | Typ. | Max. | Min.                        | Typ.  | Max.  |
| A1   | 0.90        |      | 1.10 | 0.035                       |       | 0.044 |
| A1   |             | 0.05 |      |                             | 0.002 |       |
| b    | 1.25        |      | 1.65 | 0.049                       |       | 0.065 |
| C    | 0.15        |      | 0.40 | 0.005                       |       | 0.016 |
| D    | 2.25        |      | 2.90 | 0.088                       |       | 0.115 |
| E    | 5.00        |      | 5.35 | 0.196                       |       | 0.211 |
| E1   | 3.95        |      | 4.60 | 0.155                       |       | 0.182 |
| G    |             | 2.00 |      |                             | 0.079 |       |
| G1   |             | 0.85 |      |                             | 0.033 |       |
| L    | 0.75        |      | 1.20 | 0.029                       |       |       |
| L1   |             | 0.45 |      |                             | 0.018 |       |
| L2   |             | 0.45 |      |                             | 0.018 |       |
| L3   |             | 0.05 |      |                             | 0.002 |       |
| V    |             |      | 8°   |                             |       | 8°    |
| V1   |             |      | 8°   |                             |       | 8°    |

**Figure 15. SMA Flat Notch recommended footprint in mm (inches)**

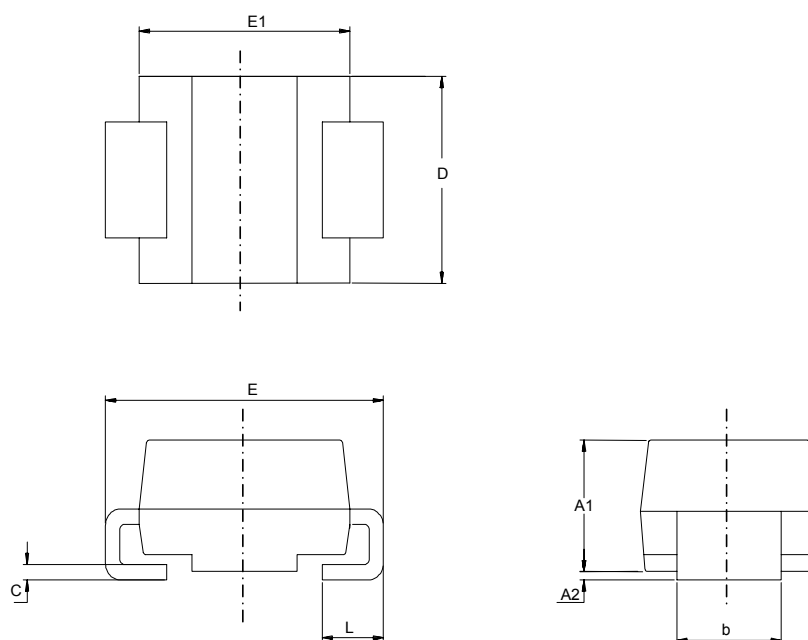




## 2.3 SMB package information

- Epoxy meets UL94, V0
- Lead-free package

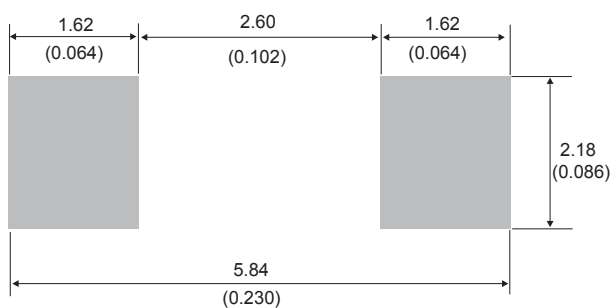
**Figure 16. SMB package outline**



**Table 6. SMB package mechanical data**

| Ref. | Dimensions  |      |                             |       |
|------|-------------|------|-----------------------------|-------|
|      | Millimeters |      | Inches (for reference only) |       |
|      | Min.        | Max. | Min.                        | Max.  |
| A1   | 1.90        | 2.45 | 0.074                       | 0.097 |
| A2   | 0.05        | 0.20 | 0.001                       | 0.008 |
| b    | 1.95        | 2.20 | 0.076                       | 0.087 |
| c    | 0.15        | 0.40 | 0.005                       | 0.016 |
| D    | 3.30        | 3.95 | 0.129                       | 0.156 |
| E    | 5.10        | 5.60 | 0.200                       | 0.221 |
| E1   | 4.05        | 4.60 | 0.159                       | 0.182 |
| L    | 0.75        | 1.50 | 0.029                       | 0.060 |

**Figure 17. SMB recommended footprint**



### 3 Ordering Information

**Table 7. Ordering information**

| Order code | Marking | Package        | Weight  | Base qty. | Delivery mode |
|------------|---------|----------------|---------|-----------|---------------|
| STPS160A   | GA6     | SMA            | 0.068 g | 5000      | Tape and reel |
| STPS160AFN | A160    | SMA Flat Notch | 0.039 g | 10 000    | Tape and reel |
| STPS160U   | E16     | SMB            | 0.107 g | 2500      | Tape and reel |

## Revision history

**Table 8. Document revision history**

| Date        | Version | Changes                                                                                                                             |
|-------------|---------|-------------------------------------------------------------------------------------------------------------------------------------|
| Jul-2003    | 6A      | Last update.                                                                                                                        |
| Aug-2004    | 7       | SMA package dimensions update. Reference A1 max changed from 2.70 mm (0.106 inc.) to 2.03 mm (0.080 inc).                           |
| 16-Feb-2007 | 8       | Reformatted to current standards. IF(RMS) removed from Table 2. Package dimensions and footprints updated. Ecopack statement added. |
| 18-Mar-2010 | 9       | Updated package illustration on page 1.                                                                                             |
| 08-Oct-2019 | 10      | Added <a href="#">Section 2.2 SMA Flat Notch package information</a> .                                                              |

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