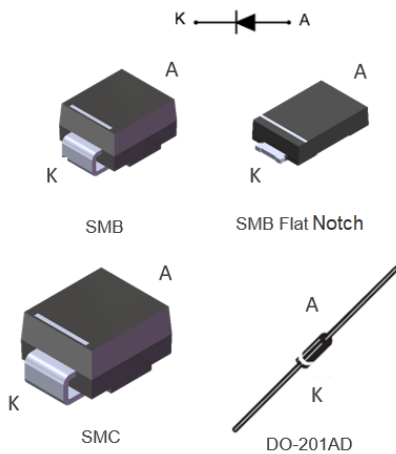


## 5 A - 60 V power Schottky rectifier



### Features

- Negligible switching losses
- Low forward voltage drop
- Low thermal resistance
- Avalanche rated
- ECOPACK2 component

### Applications

- Lighting
- Battery charger
- Set-top box
- DC / DC converter
- Notebook adapter
- Switching diode

### Description

Axial and surface mount power Schottky rectifier suited for switch mode power supplies and high frequency dc to dc converters.

Packaged in DO-201AD, SMB, SMC and SMB Flat Notch, this device is intended for use in low voltage, high frequency inverters and small battery chargers and for applications where there are space constraints, for example telecom battery charger.

| Product status  |        |
|-----------------|--------|
| STPS5L60        |        |
| Product summary |        |
| Symbol          | Value  |
| $I_{F(AV)}$     | 5 A    |
| $V_{RRM}$       | 60 V   |
| $T_{j(max.)}$   | 150 °C |
| $V_{F(typ.)}$   | 0.42 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(RMS)</sub> | Forward rms current                                   |                               |                                                 | 15          | A    |
| I <sub>F(AV)</sub>  | Average forward current, δ = 0.5, square wave         | SMB                           | T <sub>L</sub> = 80 °C                          | 5           | A    |
|                     |                                                       | SMC, DO-201AD, SMB Flat Notch | T <sub>L</sub> = 100 °C                         |             |      |
| I <sub>FSM</sub>    | Surge non repetitive forward current                  | SMC, DO-201AD, SMB            | t <sub>p</sub> = 10 ms sinusoidal               | 100         | A    |
|                     |                                                       | SMB Flat Notch                |                                                 | 205         |      |
| P <sub>ARM</sub>    | Repetitive peak avalanche power                       |                               | t <sub>p</sub> = 10 μs, T <sub>j</sub> = 125 °C | 144         | 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    | DO-201AD lead length = 10 mm | 15         | °C/W |
|               |                     | SMB                          | 20         |      |
|               |                     | SMC, SMB Flat Notch          | 15         |      |
| $R_{th(j-a)}$ | Junction to ambient | DO-201AD                     | 75         |      |

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 | $T_j = 25\text{ °C}$  | $V_R = V_{RRM}$    | -    |      | 0.22 | mA   |
|             |                         | $T_j = 100\text{ °C}$ |                    | -    | 10   | 25   |      |
|             |                         | $T_j = 110\text{ °C}$ |                    | -    | 25   | 55   |      |
|             |                         | $T_j = 125\text{ °C}$ |                    | -    | 40   | 100  |      |
| $V_F^{(1)}$ | Forward voltage drop    | $T_j = 25\text{ °C}$  | $I_F = 5\text{ A}$ | -    | 0.47 | 0.52 | V    |
|             |                         | $T_j = 100\text{ °C}$ |                    | -    | 0.43 | 0.49 |      |
|             |                         | $T_j = 125\text{ °C}$ |                    | -    | 0.42 | 0.48 |      |

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

To evaluate the conduction losses, use the following equation:

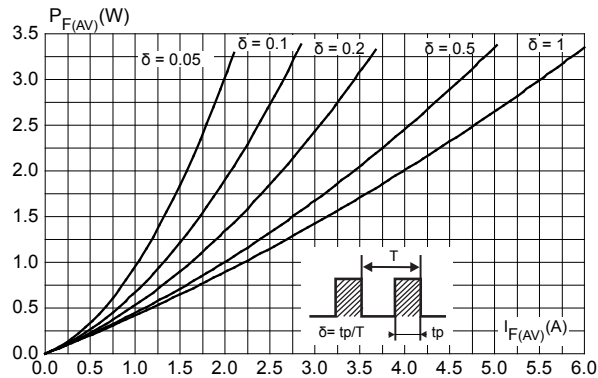
$$P = 0.39 \times I_{F(AV)} + 0.028 \times I_{F(RMS)}^2$$

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

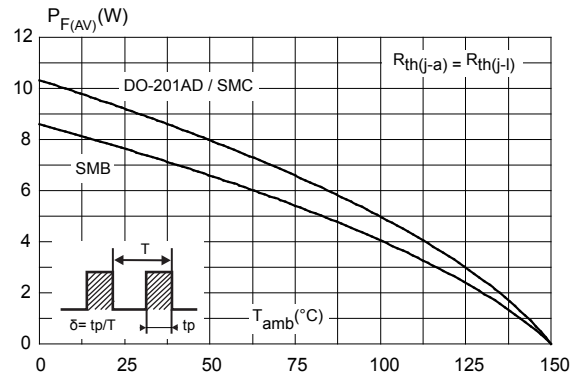
- AN604: Calculation of conduction losses in a power rectifier
- AN4021: Calculation of reverse losses on a power diode

## 1.1 Characteristics (curves)

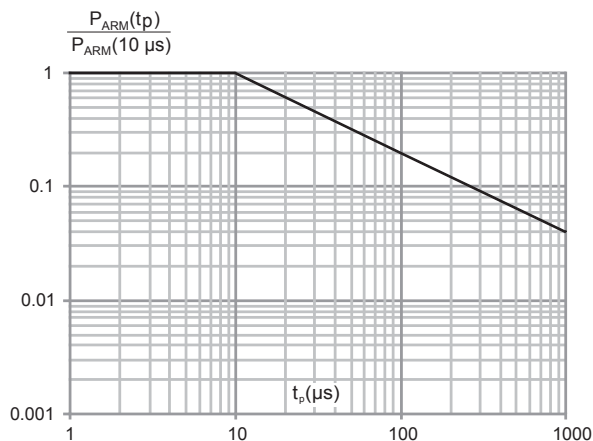
**Figure 1. Average forward power dissipation versus average forward current**



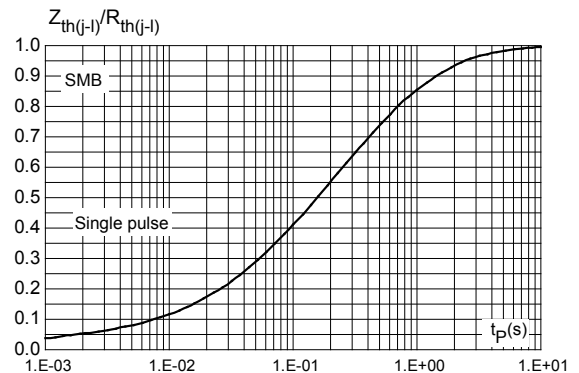
**Figure 2. Average forward current versus ambient temperature ( $\delta = 0.5$ )**



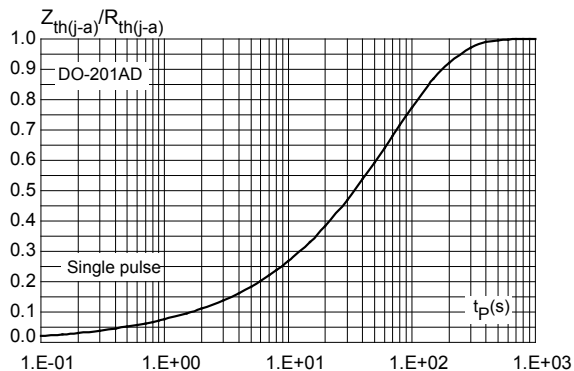
**Figure 3. Normalized avalanche power derating versus pulse duration ( $T_j = 125^\circ\text{C}$ )**



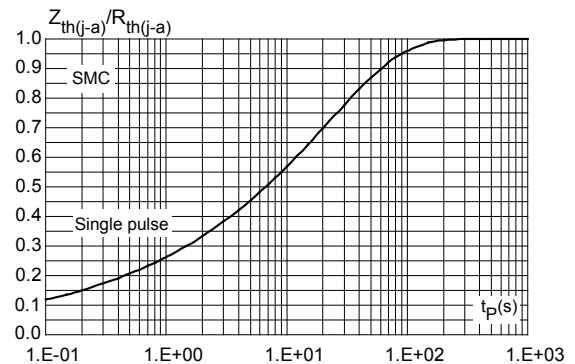
**Figure 4. Relative variation of thermal impedance junction to lead versus pulse duration (SMB)**



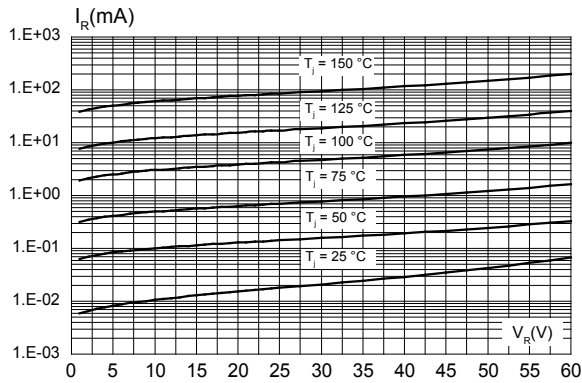
**Figure 5. Relative variation of thermal impedance junction to ambient versus pulse duration (DO-201AD)**



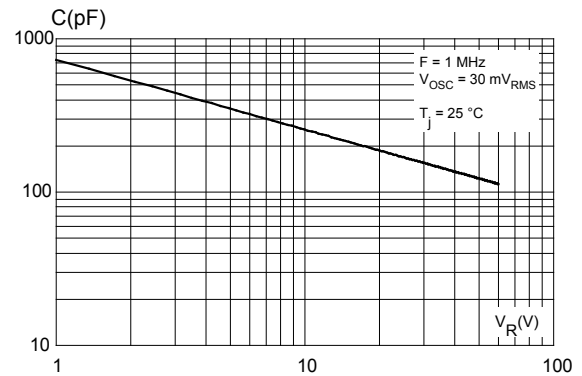
**Figure 6. Relative variation of thermal impedance junction to ambient versus pulse duration (SMC)**



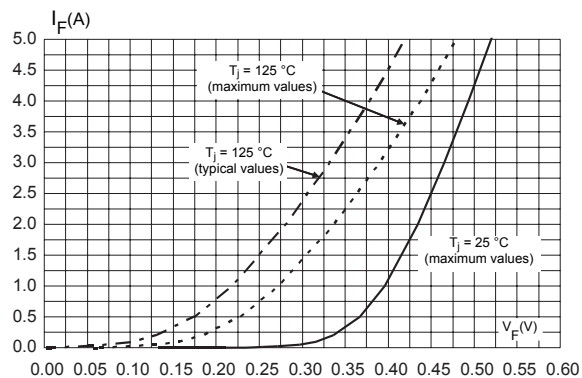
**Figure 7. Reverse leakage current versus reverse voltage applied (typical values)**



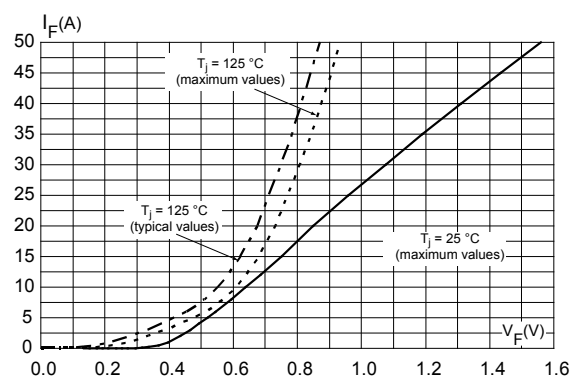
**Figure 8. Junction capacitance versus reverse voltage applied (typical values)**



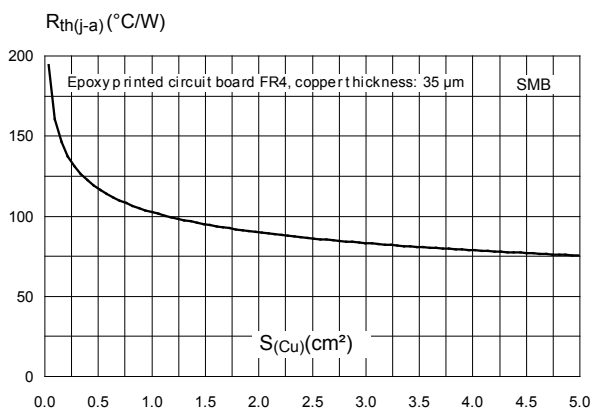
**Figure 9. Forward voltage drop versus forward current (low level)**



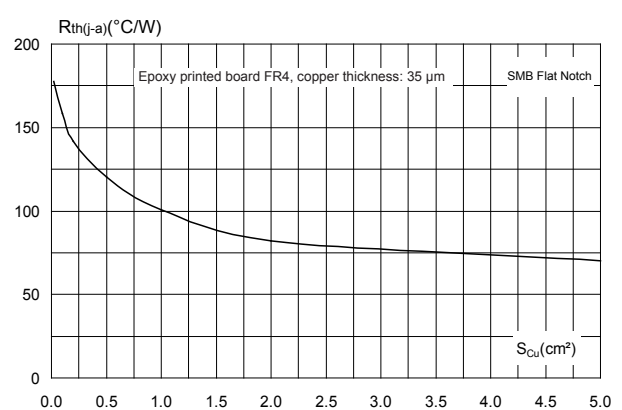
**Figure 10. Forward voltage drop versus forward current (high level)**



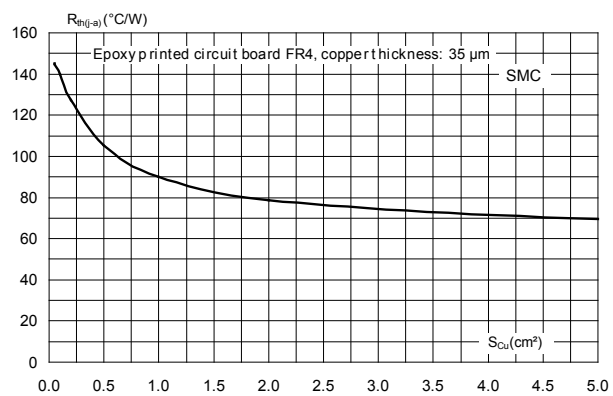
**Figure 11. Thermal resistance junction to ambient versus copper surface under each lead (SMB)**



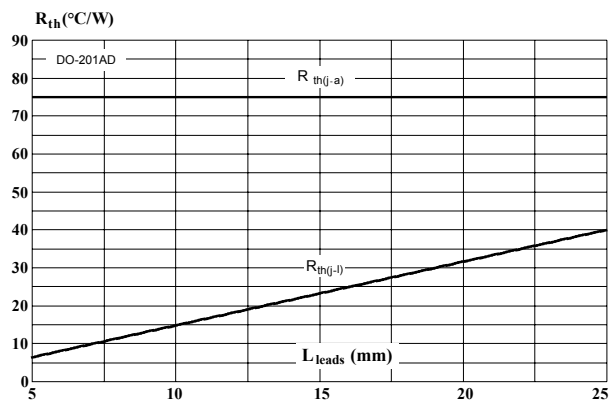
**Figure 12. Thermal resistance junction to ambient versus copper surface under each lead (SMB flat Notch)**



**Figure 13. Thermal resistance junction to ambient versus copper surface under each lead (SMC)**



**Figure 14. Thermal resistance versus lead length**



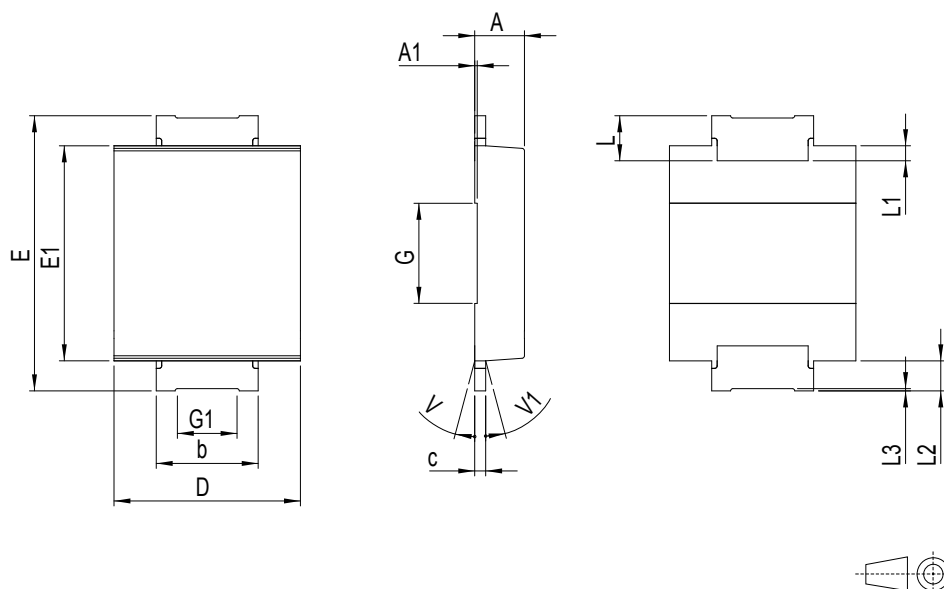
## 2 Package information

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 SMB Flat Notch package information

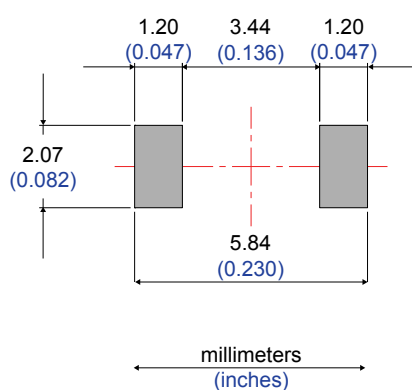
- Epoxy meets UL94, V0
- Lead-free package

**Figure 15. SMB Flat Notch package outline**



**Table 4. SMB Flat Notch mechanical data**

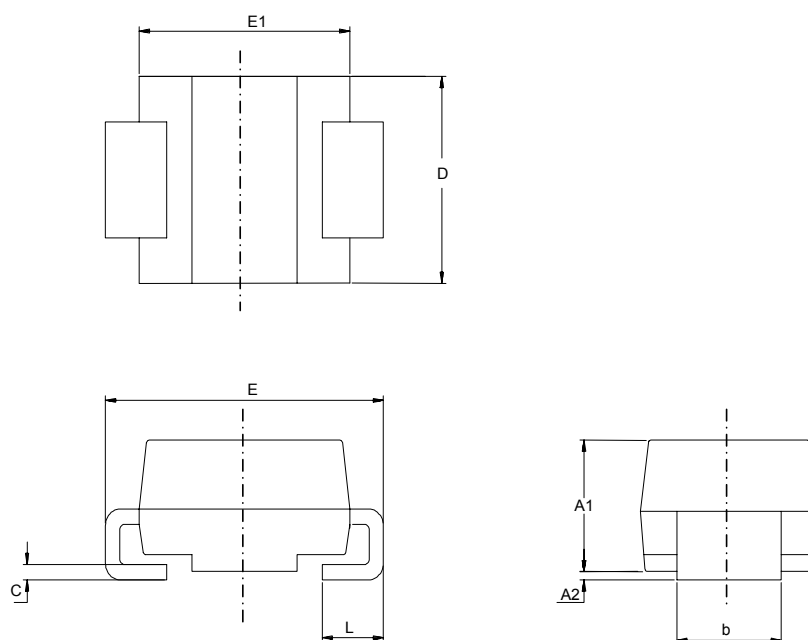
| Ref. | Dimensions  |      |      |        |       |       |
|------|-------------|------|------|--------|-------|-------|
|      | Millimeters |      |      | Inches |       |       |
|      | Min.        | Typ. | Max. | Min.   | Typ.  | Max.  |
| A    | 0.90        |      | 1.10 | 0.035  |       | 0.043 |
| A1   |             | 0.05 |      |        | 0.002 |       |
| b    | 1.95        |      | 2.20 | 0.077  |       | 0.087 |
| c    | 0.15        |      | 0.40 | 0.006  |       | 0.016 |
| D    | 3.30        |      | 3.95 | 0.130  |       | 0.156 |
| E    | 5.20        |      | 5.60 | 0.205  |       | 0.220 |
| E1   | 4.05        |      | 4.60 | 0.159  |       | 0.181 |
| G    |             | 2.00 |      |        | 0.079 |       |
| G1   |             | 1.20 |      |        | 0.047 |       |
| L    | 0.75        |      | 1.20 | 0.030  |       | 0.047 |
| L1   |             | 0.30 |      |        | 0.012 |       |
| L2   |             | 0.60 |      |        | 0.024 |       |
| L3   | 0.02        |      |      | 0.001  |       |       |
| V    |             |      | 8°   |        |       | 8°    |
| V1   |             |      | 8°   |        |       | 8°    |

**Figure 16. Footprint recommendations, dimensions in mm (inches)**


## 2.2 SMB package information

- Epoxy meets UL94, V0
- Lead-free package

**Figure 17. SMB package outline**



**Table 5. 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 |

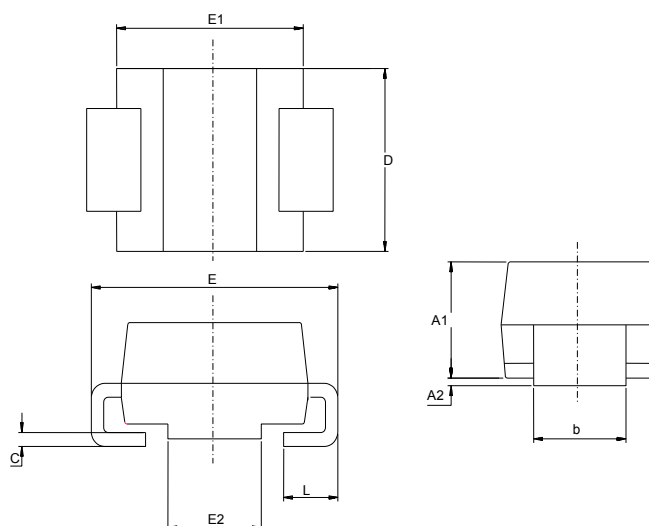
**Figure 18. SMB recommended footprint**



## 2.3 SMC package information

- Epoxy meets UL94, V0

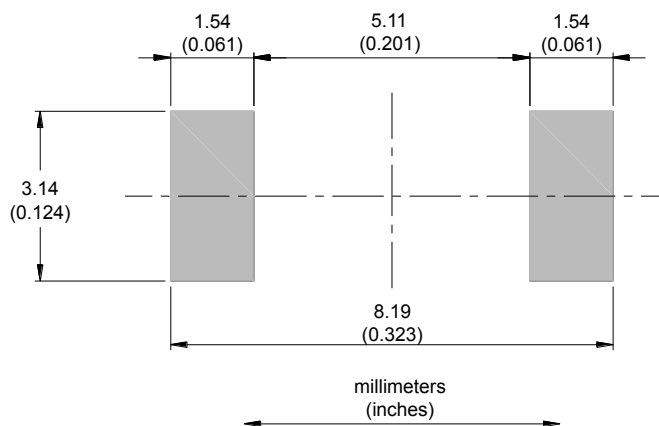
**Figure 19. SMC package outline**



**Table 6. SMC package mechanical data**

| Ref. | Dimensions  |      |                             |        |
|------|-------------|------|-----------------------------|--------|
|      | Millimeters |      | Inches (for reference only) |        |
|      | Min.        | Max. | Min.                        | Max.   |
| A1   | 1.90        | 2.45 | 0.0748                      | 0.0965 |
| A2   | 0.05        | 0.20 | 0.0020                      | 0.0079 |
| b    | 2.90        | 3.20 | 0.1142                      | 0.1260 |
| c    | 0.15        | 0.40 | 0.0059                      | 0.0157 |
| D    | 5.55        | 6.25 | 0.2185                      | 0.2461 |
| E    | 7.75        | 8.15 | 0.3051                      | 0.3209 |
| E1   | 6.60        | 7.15 | 0.2598                      | 0.2815 |
| E2   | 4.40        | 4.70 | 0.1732                      | 0.1850 |
| L    | 0.75        | 1.50 | 0.0295                      | 0.0591 |

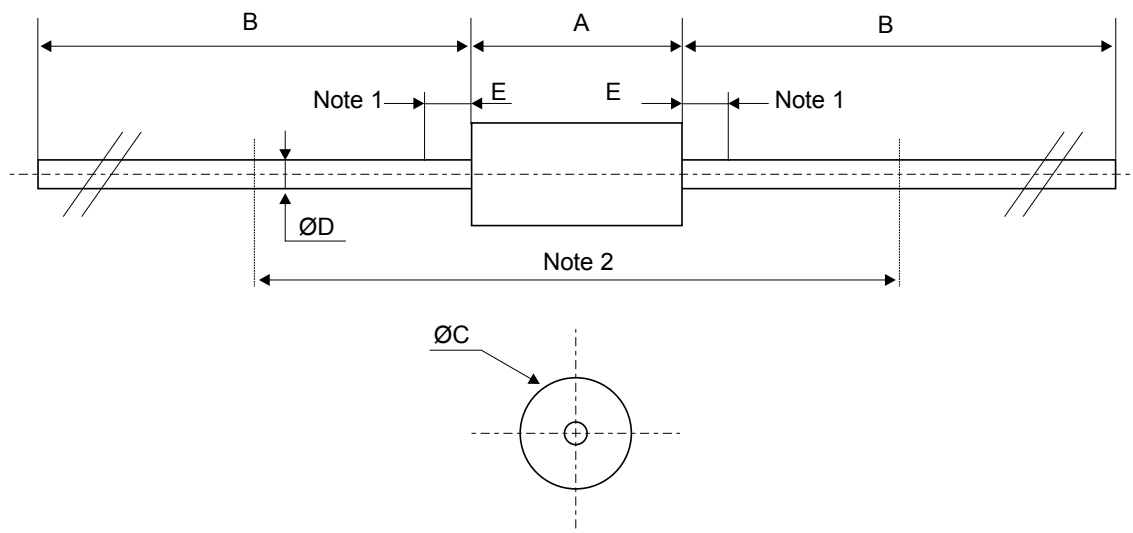
**Figure 20. SMC recommended footprint**



## 2.4 DO-201AD package information

- Epoxy meets UL 94, V0

**Figure 21. DO-201AD package outline**



**Table 7. DO-201AD package mechanical data**

| Ref.                  | Dimensions  |      |      |                             |      |       |
|-----------------------|-------------|------|------|-----------------------------|------|-------|
|                       | Millimeters |      |      | Inches (for reference only) |      |       |
|                       | Min.        | Typ. | Max. | Min.                        | Typ. | Max.  |
| A                     |             | -    | 9.50 |                             | -    | 0.374 |
| B                     | 25.40       | -    |      | 1.000                       | -    |       |
| C                     |             | -    | 5.30 |                             | -    | 0.209 |
| D <sup>(1)</sup>      |             | -    | 1.30 |                             | -    | 0.051 |
| E                     |             | -    | 1.25 |                             |      | 0.049 |
| Note 2 <sup>(2)</sup> | 15.00       |      |      | 0.590                       |      |       |

- The lead diameter D is not controlled over zone E
- The minimum length, which must stay straight between the right angles after bending, is 15 mm (0.59")

### 3 Ordering information

**Table 8. Ordering information**

| Order code  | Marking  | Package        | Weight  | Base qty. | Delivery mode |
|-------------|----------|----------------|---------|-----------|---------------|
| STPS5L60UFN | B56      | SMB Flat Notch | 0.056 g | 5000      | Tape and reel |
| STPS5L60U   | G56      | SMB            | 0.107 g | 2500      | Tape and reel |
| STPS5L60RL  | STPS5L60 | DO-201AD       | 1.12 g  | 1900      | Tape and reel |
| STPS5L60L   | STPS5L60 |                |         | 600       | Ammopack      |
| STPS5L60S   | S56      | SMC            | 0.245 g | 2500      | Tape and reel |

## Revision history

**Table 9. Document revision history**

| Date        | Version | Changes                                                                    |
|-------------|---------|----------------------------------------------------------------------------|
| July-2003   | 2       | Previous issue.                                                            |
| 16-May-2008 | 3       | Added ECOPACK statement. Added SMC package. Updated characteristic curves. |
| 17-Jul-2015 | 4       | Added SMB package information and reformatted to current standard.         |
| 31-Jan-2020 | 5       | Added <a href="#">Section 2.1 SMB Flat Notch package information</a> .     |

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