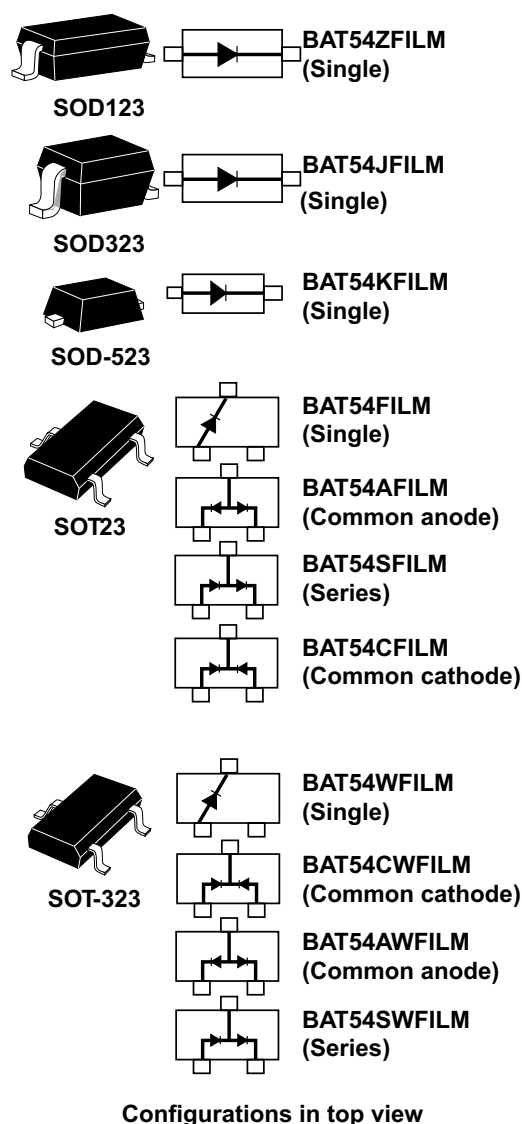


## Small signal Schottky diodes

Datasheet – production data



### Features

- Low conduction and reverse losses
- Negligible switching losses
- Low forward and reverse recovery times
- Extremely fast switching
- Surface mount device
- Low capacitance diode
- ECOPACK®2 compliant component

### Description

The BAT54 series uses 40 V Schottky barrier diodes packaged in SOD123, SOD323, SOD523, SOT-23, or SOT-323.

Table 1. Device summary

| Symbol      | Value  |
|-------------|--------|
| $I_F$       | 300 mA |
| $V_{RRM}$   | 40 V   |
| C (typ)     | 7 pF   |
| $T_j$ (max) | 150 °C |

# 1 Characteristics

**Table 2. Absolute ratings (limiting values at  $T_j = 25\text{ °C}$ , unless otherwise specified)**

| Symbol    | Parameter                            | Value                           | Unit |
|-----------|--------------------------------------|---------------------------------|------|
| $V_{RRM}$ | Repetitive peak reverse voltage      | 40                              | V    |
| $I_F$     | Continuous forward current           | 300                             | mA   |
| $I_{FSM}$ | Surge non repetitive forward current | $t_p = 10\text{ ms}$ Sinusoidal | A    |
| $T_{stg}$ | Storage temperature range            | -65 to +150                     | °C   |
| $T_j$     | Operating junction temperature range | -40 to +150                     | °C   |
| $T_L$     | Maximum soldering temperature        | 260                             | °C   |

**Table 3. Thermal parameters**

| Symbol        | Parameter                          | Value           | Unit |
|---------------|------------------------------------|-----------------|------|
| $R_{th(j-a)}$ | Junction to ambient <sup>(1)</sup> | SOT-23, SOD-123 | 500  |
|               |                                    | SOT-323, SOD323 | 550  |
|               |                                    | SOD-523         | 600  |

1. Epoxy printed circuit board with recommended pad layout

**Table 4. Static electrical characteristics**

| Symbol      | Parameter               | Test conditions       | Min.                  | Typ. | Max. | Unit          |
|-------------|-------------------------|-----------------------|-----------------------|------|------|---------------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25\text{ °C}$  | $V_R = 30\text{ V}$   |      | 1    | $\mu\text{A}$ |
|             |                         | $T_j = 100\text{ °C}$ |                       |      | 100  |               |
| $V_F^{(2)}$ | Forward voltage drop    | $T_j = 25\text{ °C}$  | $I_F = 0.1\text{ mA}$ |      | 240  | mV            |
|             |                         |                       | $I_F = 1\text{ mA}$   |      | 320  |               |
|             |                         |                       | $I_F = 10\text{ mA}$  |      | 400  |               |
|             |                         |                       | $I_F = 30\text{ mA}$  |      | 500  |               |
|             |                         |                       | $I_F = 100\text{ mA}$ |      | 900  |               |

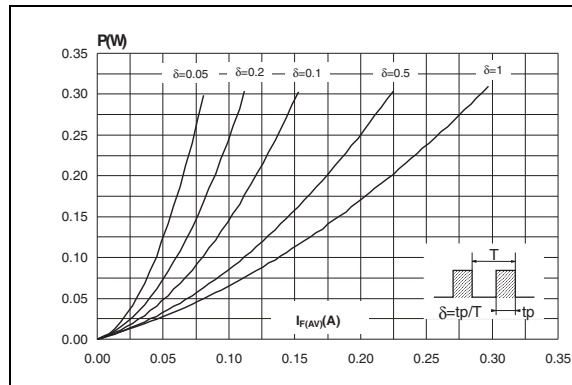
1. Pulse test:  $t_p = 5\text{ ms}$ ,  $\delta < 2\%$

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

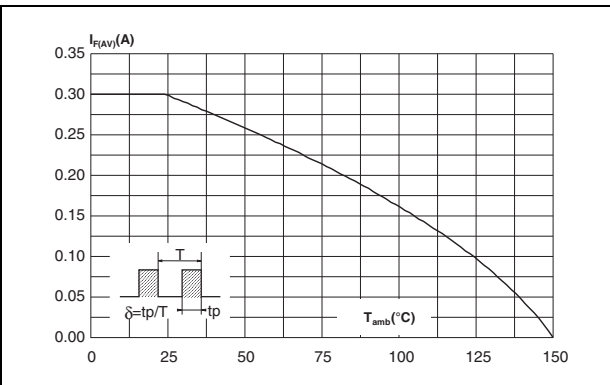
**Table 5. Dynamic characteristics**

| Symbol   | Parameter             | Test conditions                                                                                                          | Min. | Typ. | Max. | Unit |
|----------|-----------------------|--------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| C        | Diode capacitance     | $V_R = 1\text{ V}$ , $F = 1\text{ MHz}$                                                                                  |      | 7    | 10   | pF   |
| $t_{rr}$ | Reverse recovery time | $I_F = 10\text{ mA}$ , $I_R = 10\text{ mA}$ , $T_j = 25\text{ °C}$<br>$I_{rr} = 1\text{ mA}$ , $R_L = 100\text{ }\Omega$ |      |      | 5    | ns   |

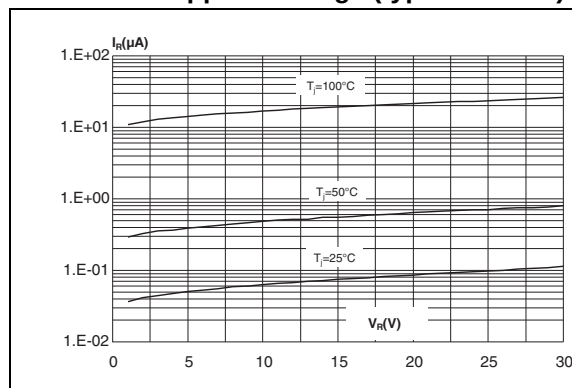
**Figure 1. Average forward power dissipation versus average forward current**



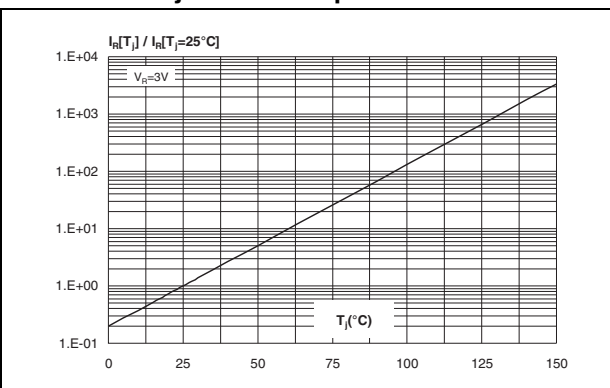
**Figure 2. Average forward current versus ambient temperature ( $\delta = 1$ )**



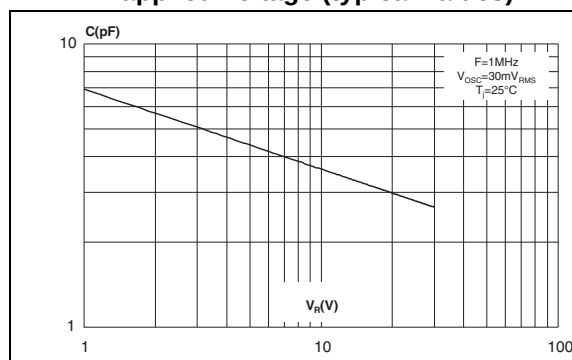
**Figure 3. Reverse leakage current versus reverse applied voltage (typical values)**



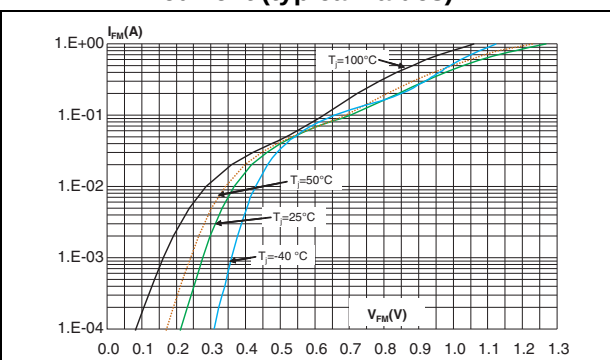
**Figure 4. Reverse leakage current versus junction temperature**



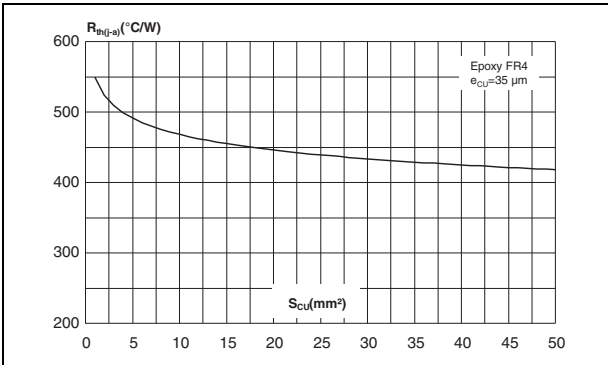
**Figure 5. Junction capacitance versus reverse applied voltage (typical values)**



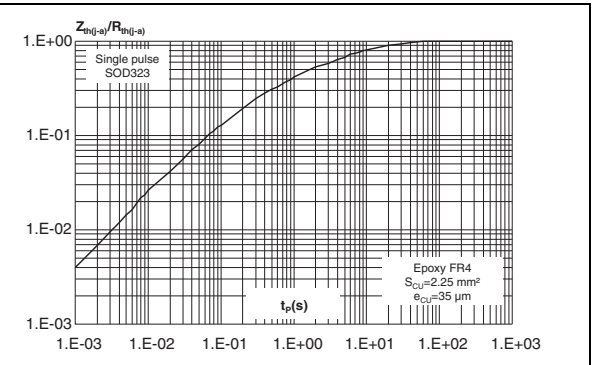
**Figure 6. Forward voltage drop versus forward current (typical values)**



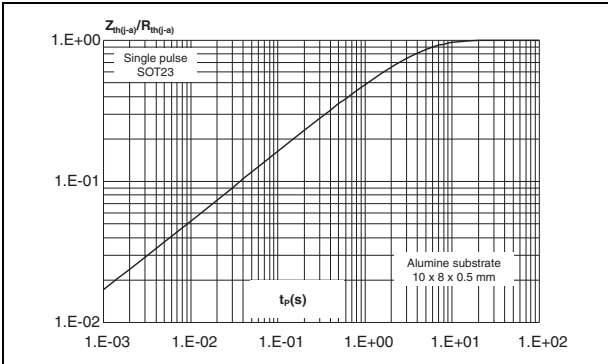
**Figure 7. Thermal resistance junction to ambient versus copper surface under each lead (SOD323)**



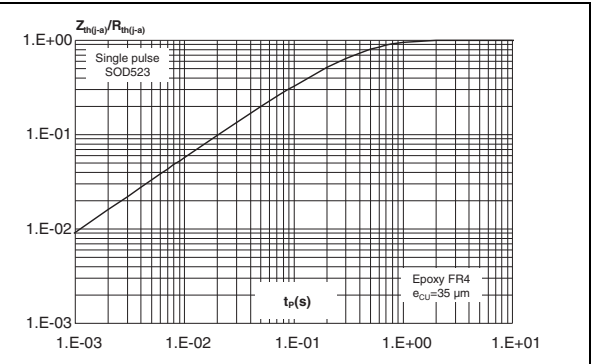
**Figure 8. Relative variation of thermal impedance junction to ambient versus pulse duration (SOD323)**



**Figure 9. Relative variation of thermal impedance junction to ambient versus pulse duration (SOT23)**



**Figure 10. Relative variation of thermal impedance junction to ambient versus pulse duration (SOD-523)**



## 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<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

Figure 11. SOD123 dimension definitions

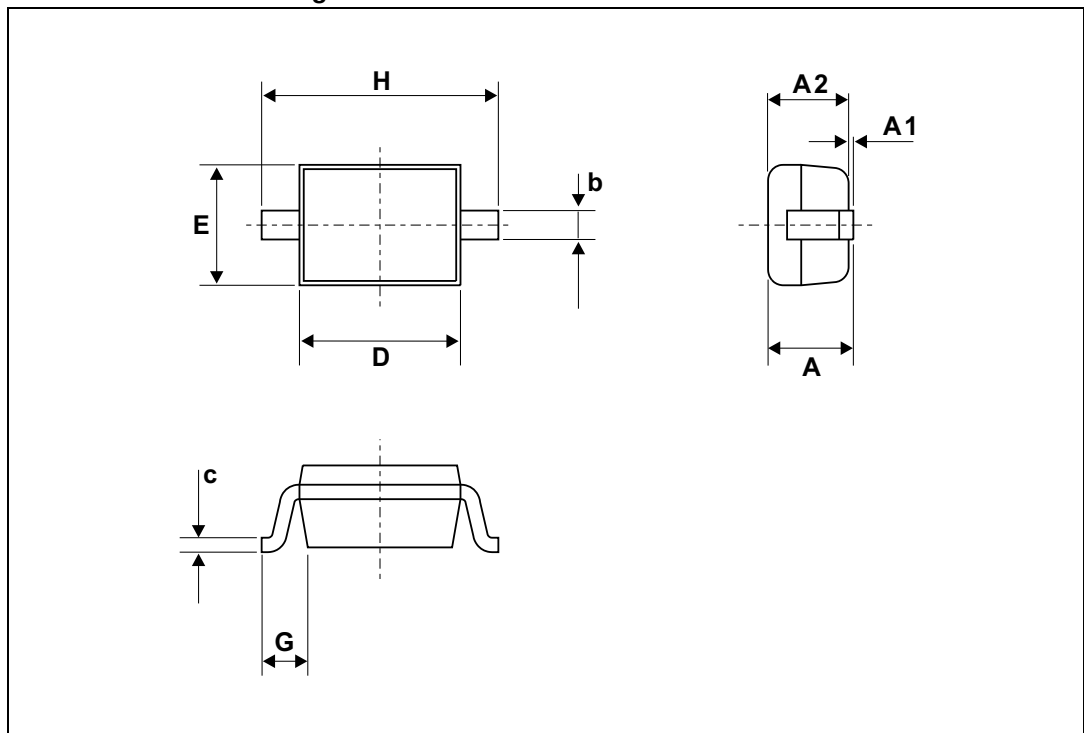


Table 6. SOD123 dimension values

| Ref. | Dimensions  |      |      |        |       |       |
|------|-------------|------|------|--------|-------|-------|
|      | Millimeters |      |      | Inches |       |       |
|      | Min.        | Typ. | Max. | Min.   | Typ.  | Max.  |
| A    |             |      | 1.45 |        |       | 0.057 |
| A1   | 0           |      | 0.10 |        | 0     | 0.004 |
| A2   | 0.85        |      | 1.35 | 0.033  |       | 0.053 |
| b    |             | 0.55 |      |        | 0.022 |       |
| c    |             | 0.15 |      |        | 0.039 |       |
| D    | 2.55        |      | 2.85 | 0.1    |       | 0.112 |
| E    | 1.4         |      | 1.70 | 0.055  |       | 0.067 |
| G    | 0.25        |      |      | 0.01   |       |       |
| H    | 3.55        |      | 3.75 | 0.14   |       | 0.148 |

Figure 12. SOD123 footprint dimensions in mm (inches)

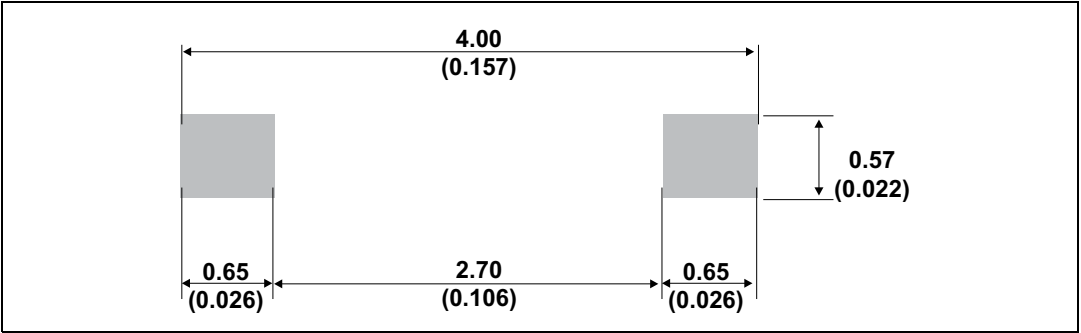


Figure 13. SOD323 dimension definitions

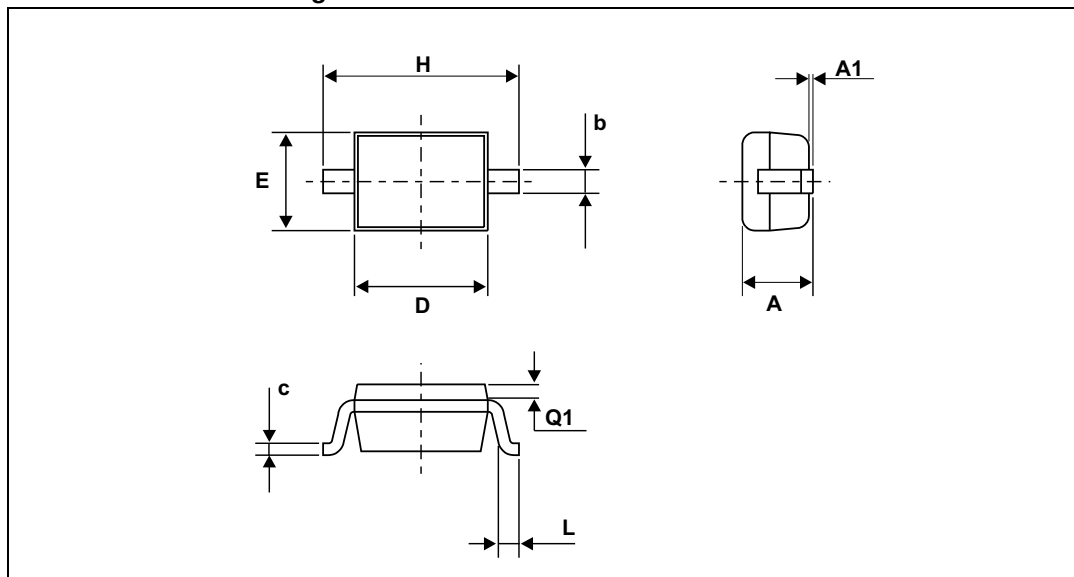


Table 7. SOD323 dimension values

| Ref. | Dimensions  |      |      |        |      |       |
|------|-------------|------|------|--------|------|-------|
|      | Millimeters |      |      | Inches |      |       |
|      | Min.        | Typ. | Max. | Min.   | Typ. | Max.  |
| A    |             |      | 1.17 |        |      | 0.046 |
| A1   | 0           |      | 0.1  | 0      |      | 0.004 |
| b    | 0.25        |      | 0.44 | 0.01   |      | 0.017 |
| c    | 0.1         |      | 0.25 | 0.004  |      | 0.01  |
| D    | 1.52        |      | 1.8  | 0.06   |      | 0.071 |
| E    | 1.11        |      | 1.45 | 0.044  |      | 0.057 |
| H    | 2.3         |      | 2.7  | 0.09   |      | 0.106 |
| L    | 0.1         |      | 0.46 | 0.004  |      | 0.02  |
| Q1   | 0.1         |      | 0.41 | 0.004  |      | 0.016 |

Figure 14. SOD323 footprint dimensions in mm (inches)

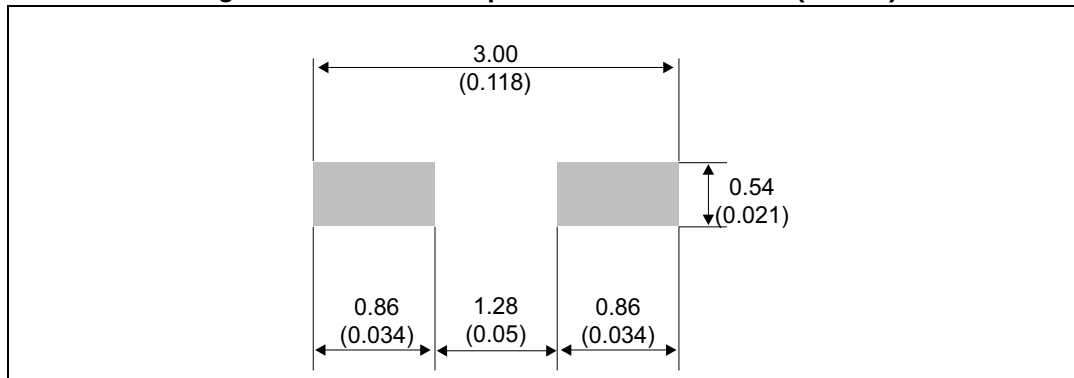


Figure 15. SOD-523 dimension definitions

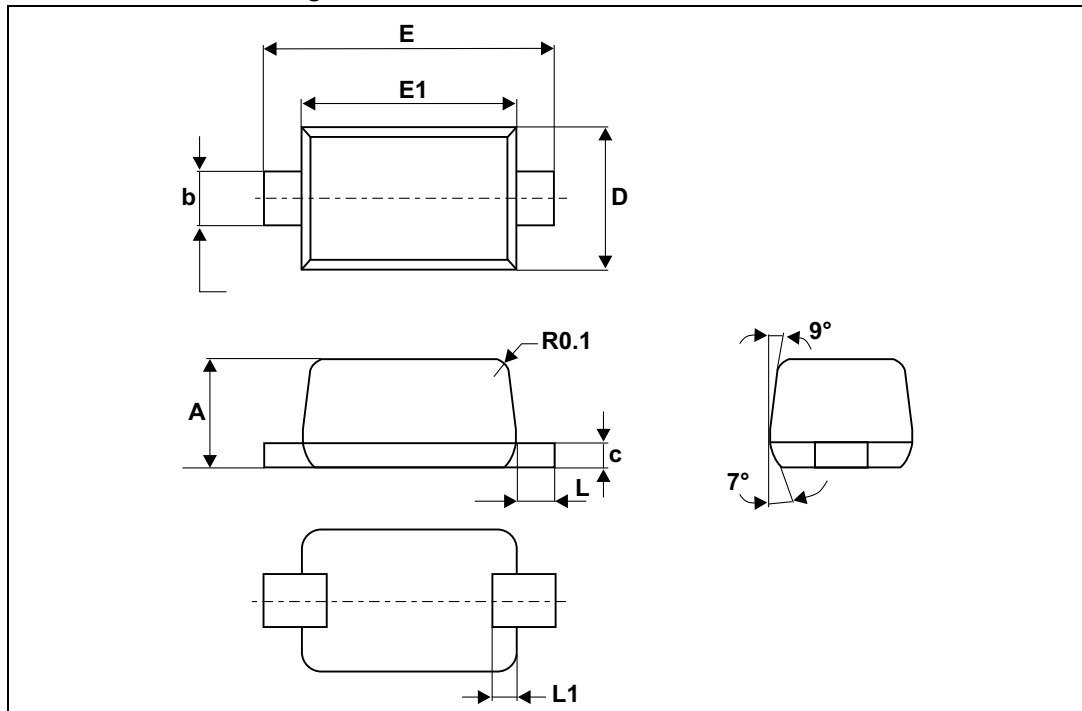


Table 8. SOD-523 dimension values

| Ref. | Dimensions  |      |      |        |       |       |
|------|-------------|------|------|--------|-------|-------|
|      | Millimeters |      |      | Inches |       |       |
|      | Min.        | Typ. | Max. | Min.   | Typ.  | Max.  |
| A    | 0.50        | 0.60 | 0.70 | 0.020  | 0.024 | 0.028 |
| E    | 1.50        | 1.60 | 1.70 | 0.059  | 0.063 | 0.067 |
| E1   | 1.10        | 1.20 | 1.30 | 0.043  | 0.047 | 0.051 |
| D    | 0.70        | 0.80 | 0.90 | 0.028  | 0.031 | 0.035 |
| b    | 0.25        |      | 0.35 | 0.010  |       | 0.014 |
| c    | 0.07        |      | 0.20 | 0.003  |       | 0.008 |
| L    | 0.15        | 0.20 | 0.25 | 0.006  | 0.008 | 0.010 |
| L1   | 0.05        |      | 0.20 | 0.002  |       | 0.008 |

Figure 16. SOD-523 footprint dimensions in mm (inches)

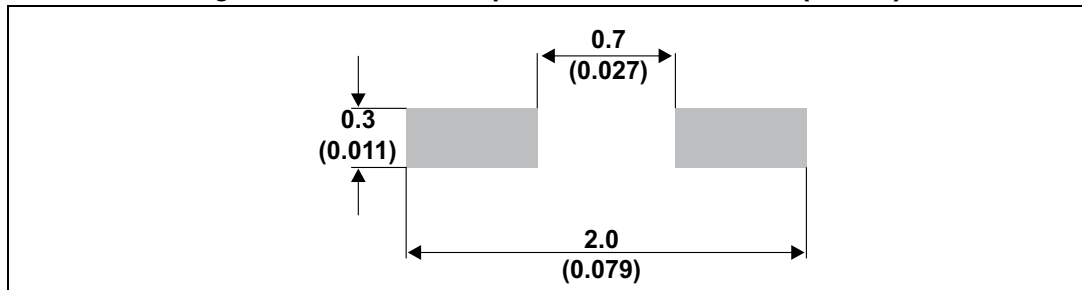




Figure 17. SOT23 dimension definitions

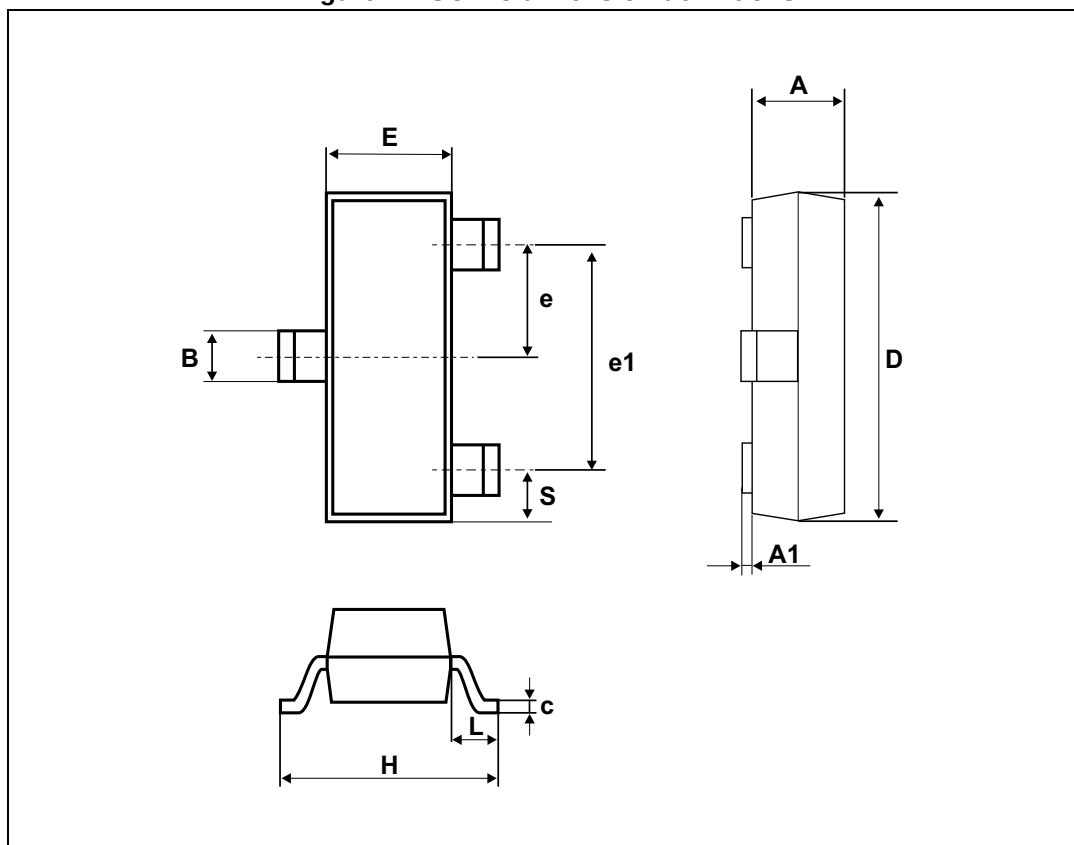


Table 9. SOT23 dimension values

| Ref. | Dimensions  |      |      |        |       |       |
|------|-------------|------|------|--------|-------|-------|
|      | Millimeters |      |      | Inches |       |       |
|      | Min.        | Typ. | Max. | Min.   | Typ.  | Max.  |
| A    | 0.89        |      | 1.4  | 0.035  |       | 0.055 |
| A1   | 0           |      | 0.1  | 0      |       | 0.004 |
| B    | 0.3         |      | 0.51 | 0.012  |       | 0.02  |
| c    | 0.085       |      | 0.18 | 0.003  |       | 0.007 |
| D    | 2.75        |      | 3.04 | 0.108  |       | 0.12  |
| e    | 0.85        |      | 1.05 | 0.033  |       | 0.041 |
| e1   | 1.7         |      | 2.1  | 0.067  |       | 0.083 |
| E    | 1.2         |      | 1.75 | 0.047  |       | 0.069 |
| H    | 2.1         |      | 3.00 | 0.083  |       | 0.118 |
| L    |             | 0.6  |      |        | 0.024 |       |
| S    | 0.35        |      | 0.65 | 0.014  |       | 0.026 |

Figure 18. SOT23 footprint dimensions in mm (inches)

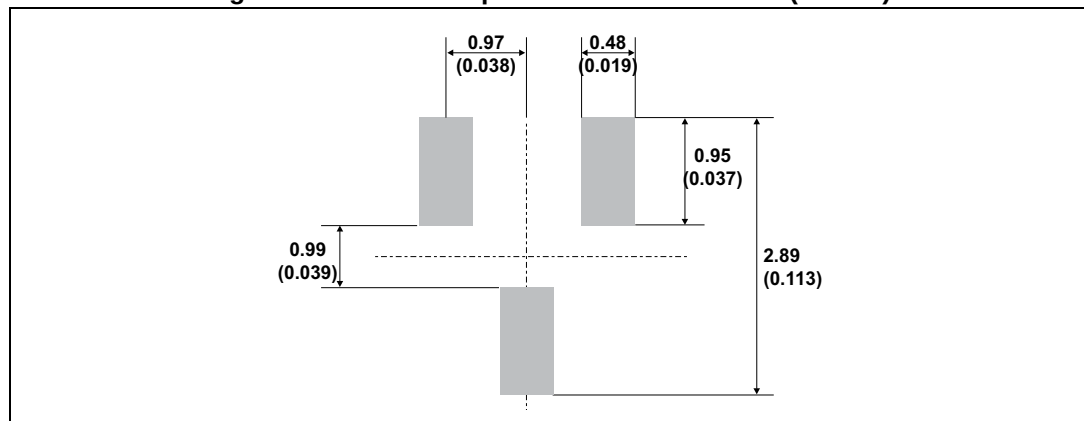


Figure 19. SOT-323 dimension definitions

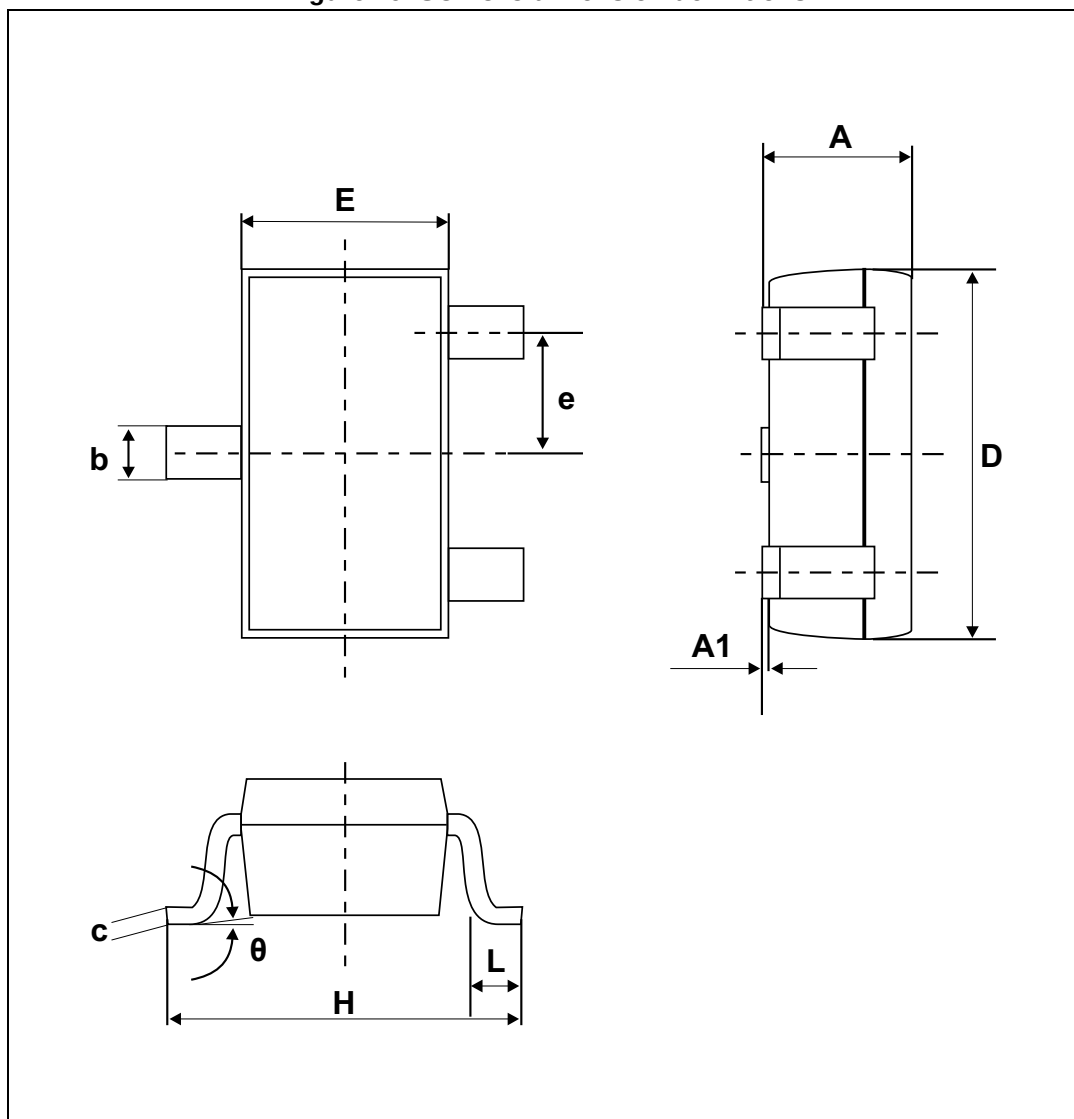
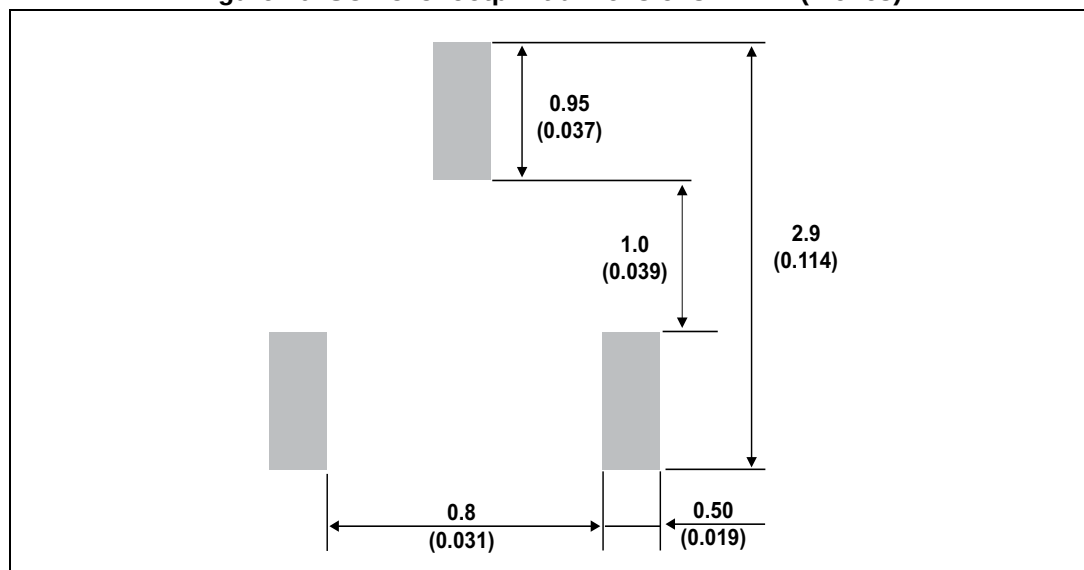


Table 10. SOT-323 dimension values

| Ref. | Dimensions  |      |      |        |       |       |
|------|-------------|------|------|--------|-------|-------|
|      | Millimeters |      |      | Inches |       |       |
|      | Min.        | Typ. | Max. | Min.   | Typ.  | Max.  |
| A    | 0.8         |      | 1.1  | 0.031  |       | 0.043 |
| A1   | 0.0         |      | 0.1  | 0.0    |       | 0.004 |
| b    | 0.25        |      | 0.4  | 0.010  |       | 0.016 |
| c    | 0.1         |      | 0.26 | 0.004  |       | 0.010 |
| D    | 1.8         | 2.0  | 2.2  | 0.071  | 0.079 | 0.086 |
| E    | 1.15        | 1.25 | 1.35 | 0.045  | 0.049 | 0.053 |
| e    | 0.6         | 0.65 | 0.7  | 0.023  | 0.026 | 0.027 |
| H    | 1.8         | 2.1  | 2.4  | 0.071  | 0.083 | 0.094 |
| L    | 0.1         | 0.2  | 0.3  | 0.004  | 0.008 | 0.012 |
| q    | 0           |      | 30°  | 0      |       | 30°   |

Figure 20. SOT-323 footprint dimensions in mm (inches)



### 3 Ordering information

Figure 21. Ordering information scheme

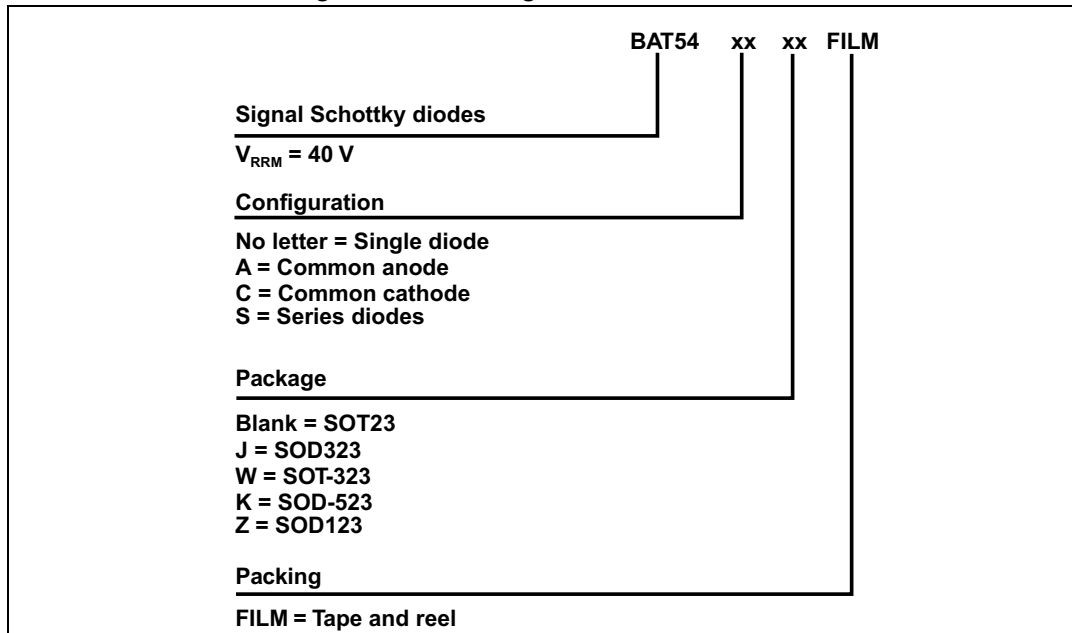


Table 11. Ordering information

| Order code    | Marking | Package                   | Weight | Base qty | Delivery mode |
|---------------|---------|---------------------------|--------|----------|---------------|
| BAT54FILM     | D86     | SOT-23 Single             | 10 mg  | 3000     | Tape and reel |
| BAT54SFILM    | D88     | SOT-23 Serial             | 10 mg  | 3000     | Tape and reel |
| BAT54CFILM    | D87     | SOT-23<br>Common cathode  | 10 mg  | 3000     | Tape and reel |
| BAT54AFILM    | D84     | SOT-23<br>Common anode    | 10 mg  | 3000     | Tape and reel |
| BAT54WFILM    | D73     | SOT-323 Single            | 6 mg   | 3000     | Tape and reel |
| BAT54SWFILM   | D78     | SOT-323 Serial            | 6 mg   | 3000     | Tape and reel |
| BAT54CWFILM   | D77     | SOT-323<br>Common cathode | 6 mg   | 3000     | Tape and reel |
| BAT54AWFILM   | D74     | SOT-323<br>Common anode   | 6 mg   | 3000     | Tape and reel |
| BAT54JFILM    | 86      | SOD-323                   | 5 mg   | 3000     | Tape and reel |
| BAT54JFILM-HQ | 86      | SOD-323                   | 5 mg   | 10000    | Tape and reel |
| BAT54KFILM    | 86      | SOD-523                   | 1.4 mg | 3000     | Tape and reel |
| BAT54ZFILM    | D72     | SOD-123                   | 10 mg  | 3000     | Tape and reel |

## 4 Revision history

**Table 12. Document revision history**

| Date        | Revision | Changes                                                                                                                              |
|-------------|----------|--------------------------------------------------------------------------------------------------------------------------------------|
| Jun-1999    | 8        | Last update.                                                                                                                         |
| 24-Jul-2006 | 9        | BAT54, A, C, S and BAT54J / W / AW / CW /SW datasheets merged. ECOPACK statement added. SOD-123, SOD-523 and SOT-666 packages added. |
| 13-Oct-2009 | 10       | Updated Table 8 quote "L1" from 0.10 to 0.05.                                                                                        |
| 02-Feb-2015 | 11       | Updated Figure 22 for product in end of life. Removed SOT-666 package information and reformatted to current standard.               |
| 28-Jun-2016 | 12       | Updated <a href="#">Table 11</a> .                                                                                                   |

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