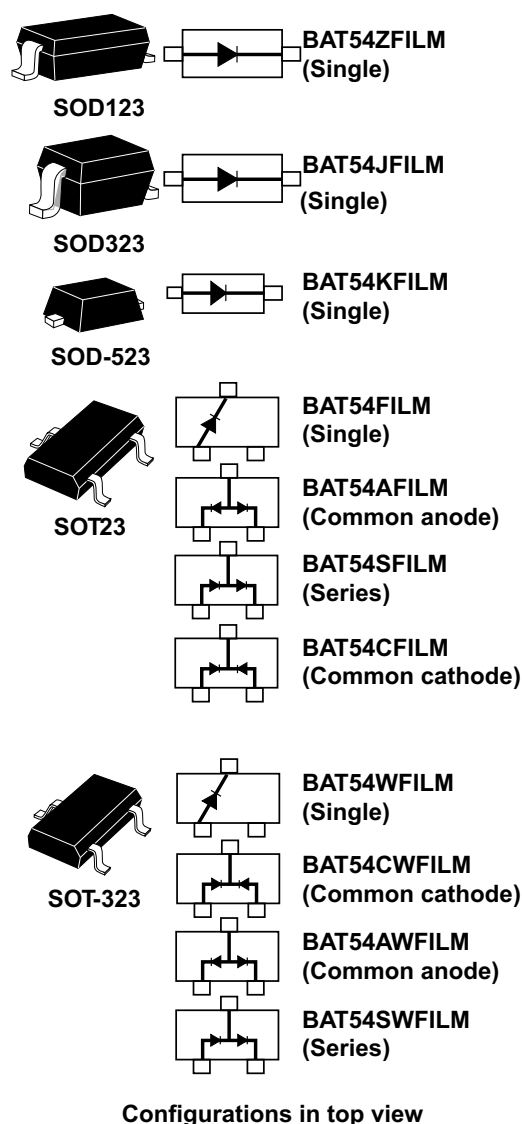


## Small signal Schottky diodes

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  |               |

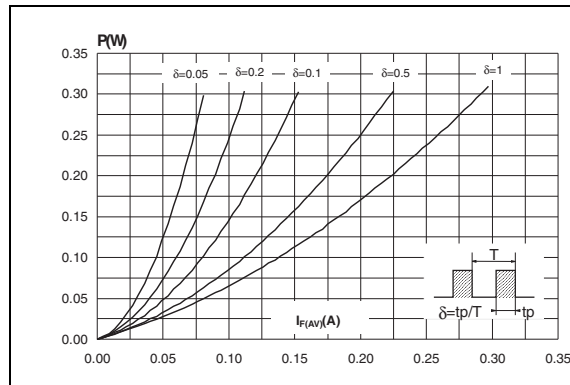
1. Pulse test:  $t_p = 5\text{ ms}$ ,  $\delta < 2\%$

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

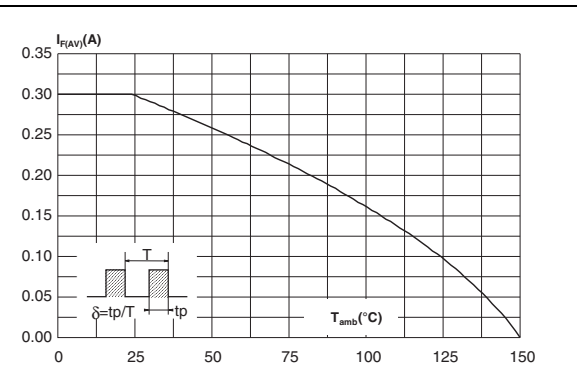
**Table 5. Dynamic characteristics**

| 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   |

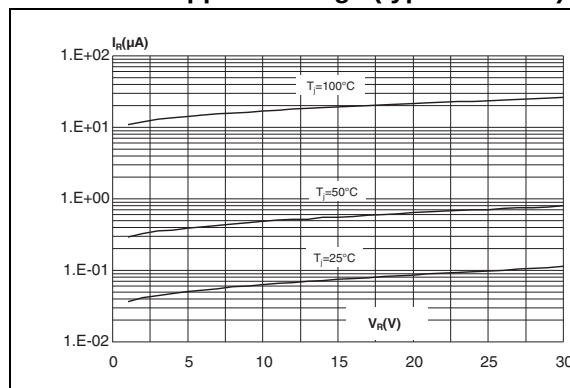
**Figure 1. Average forward power dissipation versus average forward current**



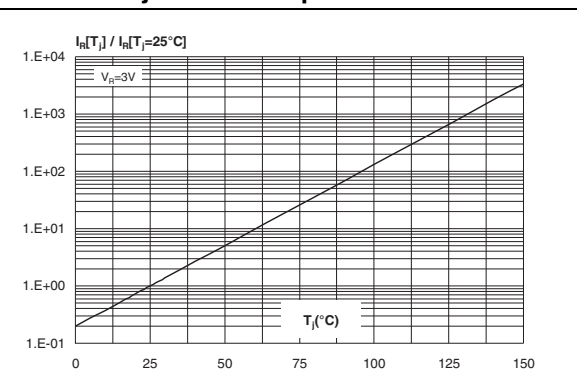
**Figure 2. Average forward current versus ambient temperature ( $\delta = 1$ )**



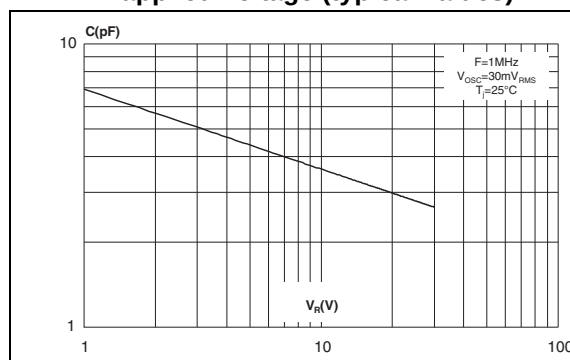
**Figure 3. Reverse leakage current versus reverse applied voltage (typical values)**



**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)**

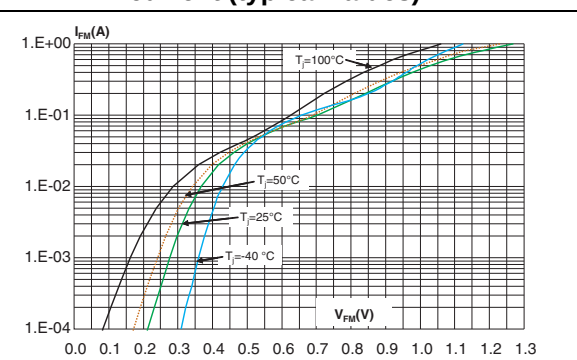


Figure 7. Thermal resistance junction to ambient versus copper surface under each lead (SOD323)

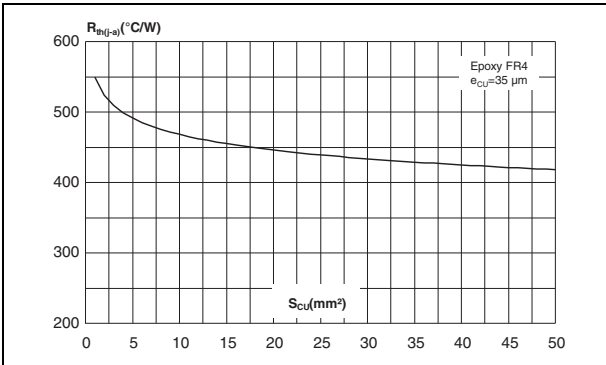


Figure 8. Relative variation of thermal impedance junction to ambient versus pulse duration (SOD323)

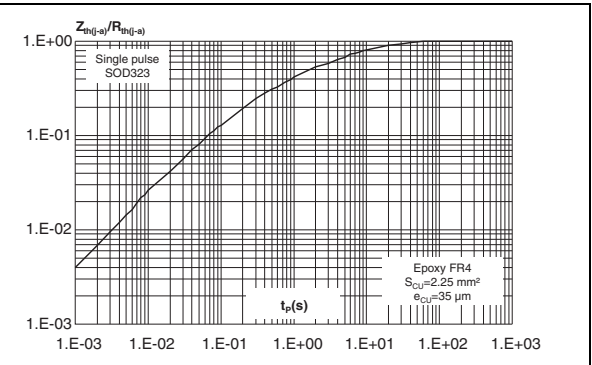


Figure 9. Relative variation of thermal impedance junction to ambient versus pulse duration (SOT23)

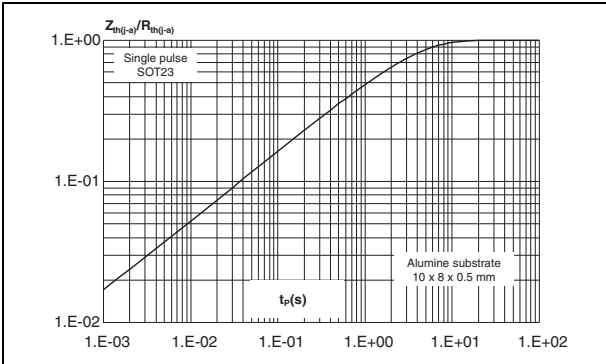
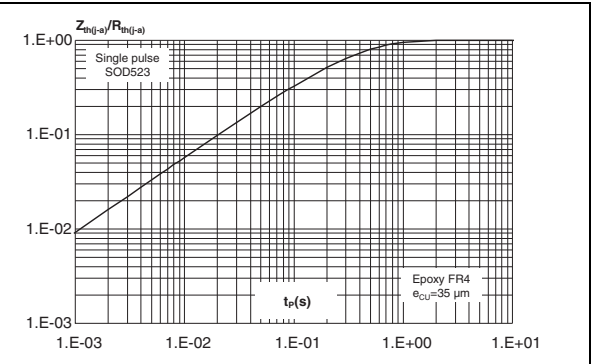


Figure 10. Relative variation of thermal impedance junction to ambient versus pulse duration (SOD-523)



## 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

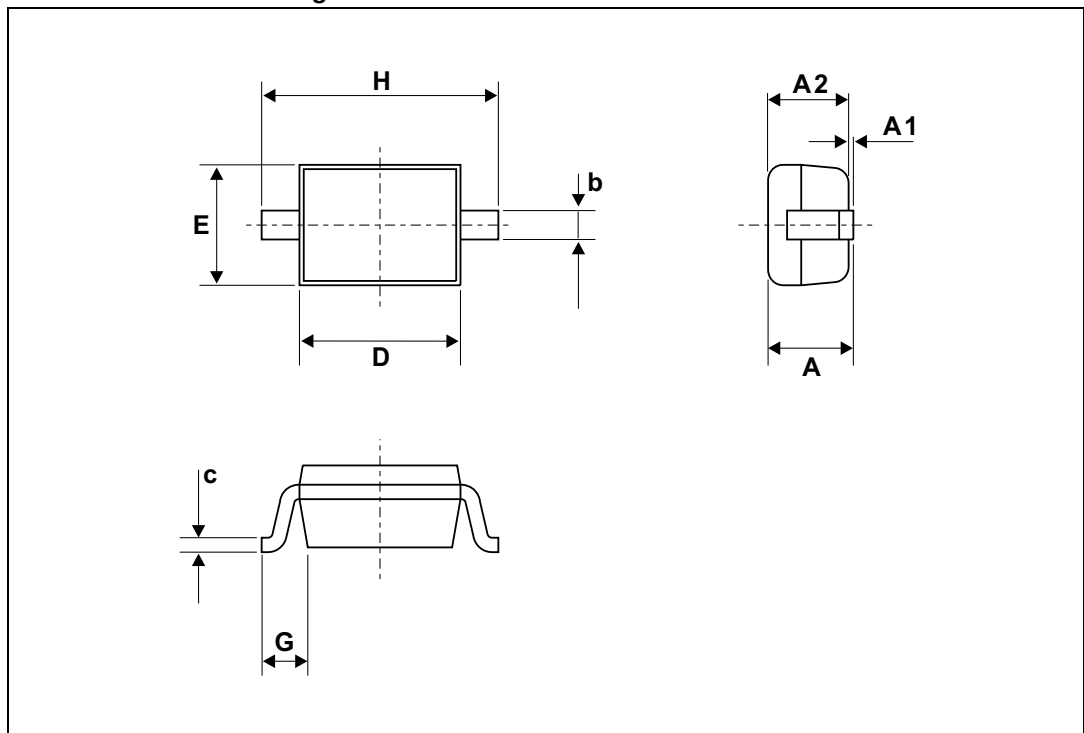


Table 6. SOD123 dimension values

| 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)

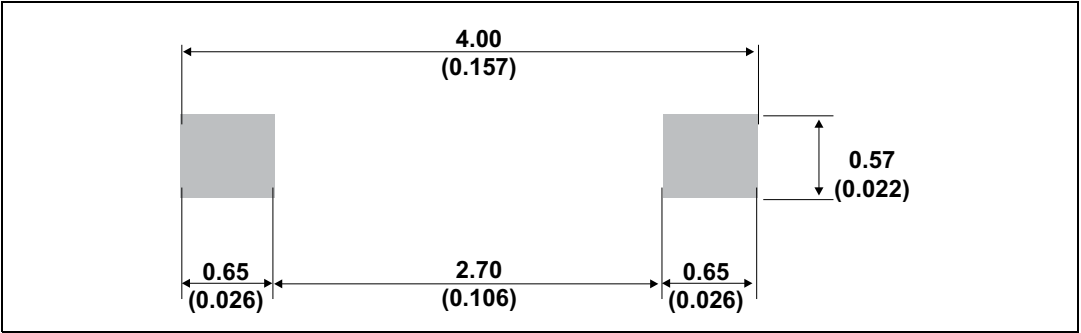


Figure 13. SOD323 dimension definitions

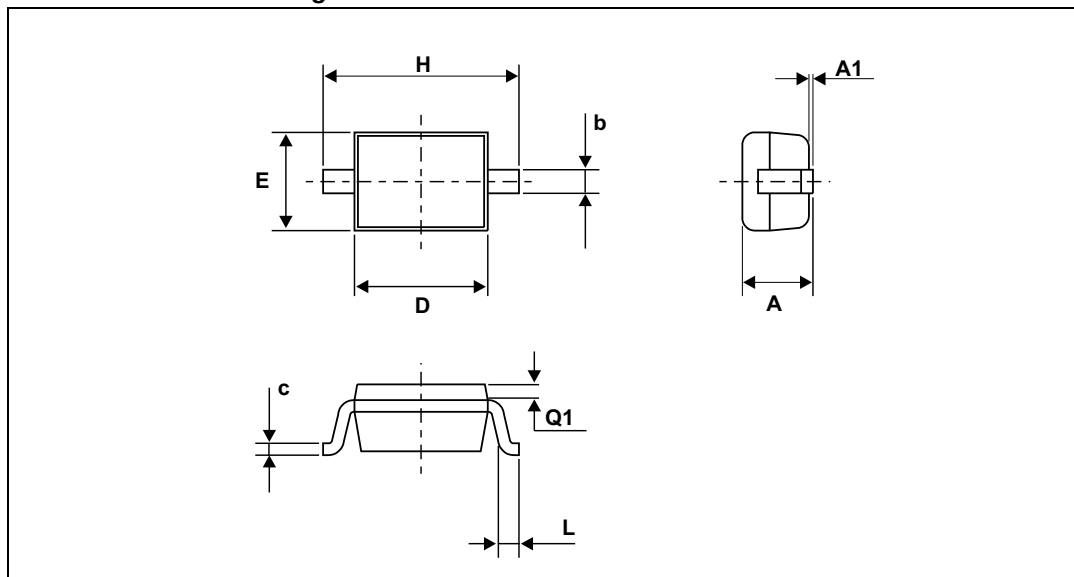


Table 7. SOD323 dimension values

| 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)

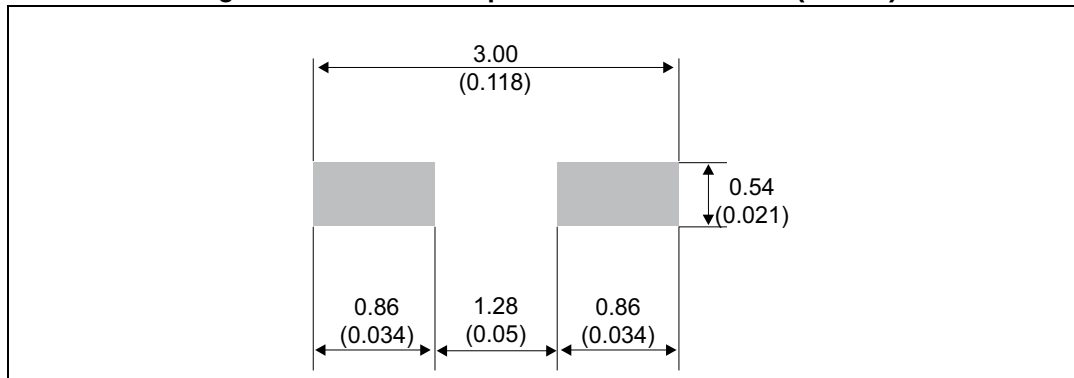


Figure 15. SOD-523 dimension definitions

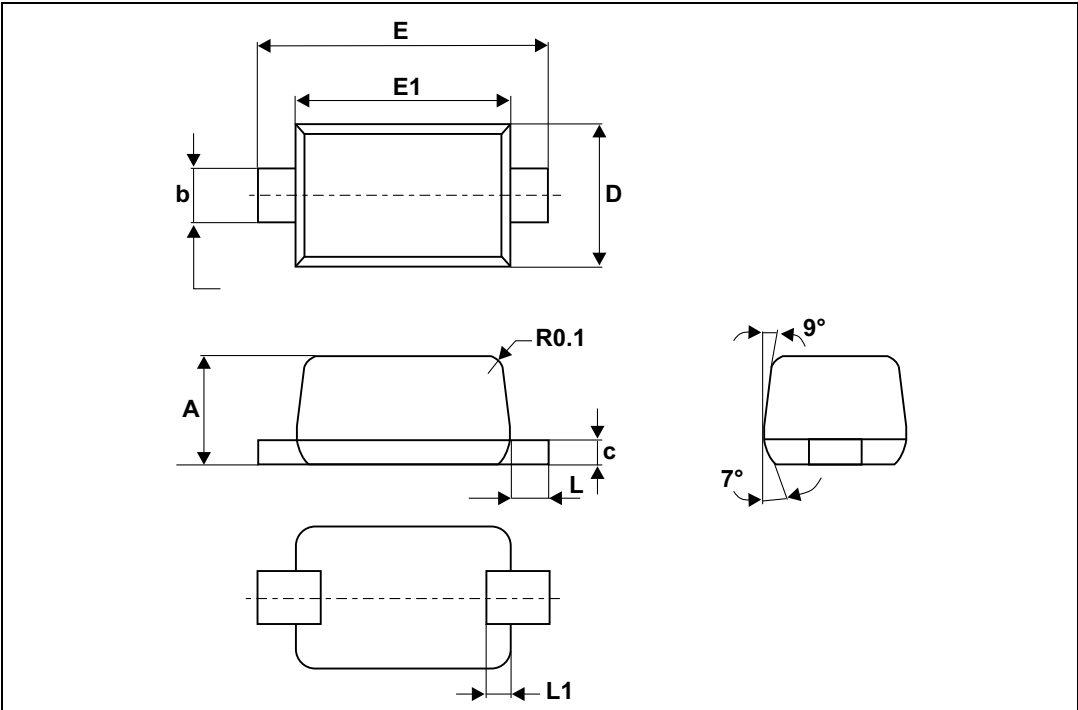


Table 8. SOD-523 dimension values

| 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)

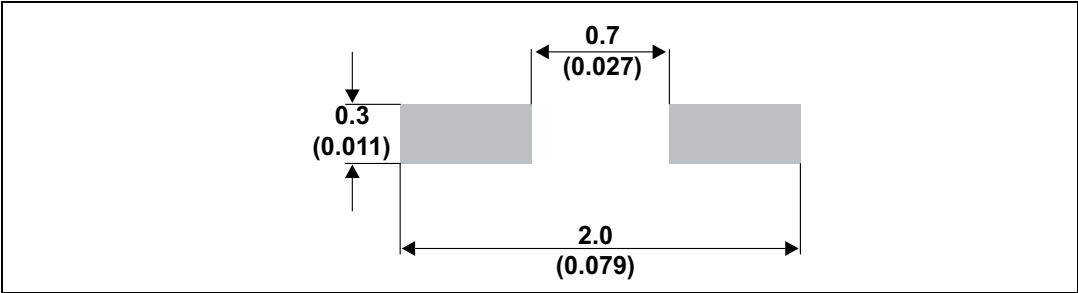




Figure 17. SOT23 dimension definitions

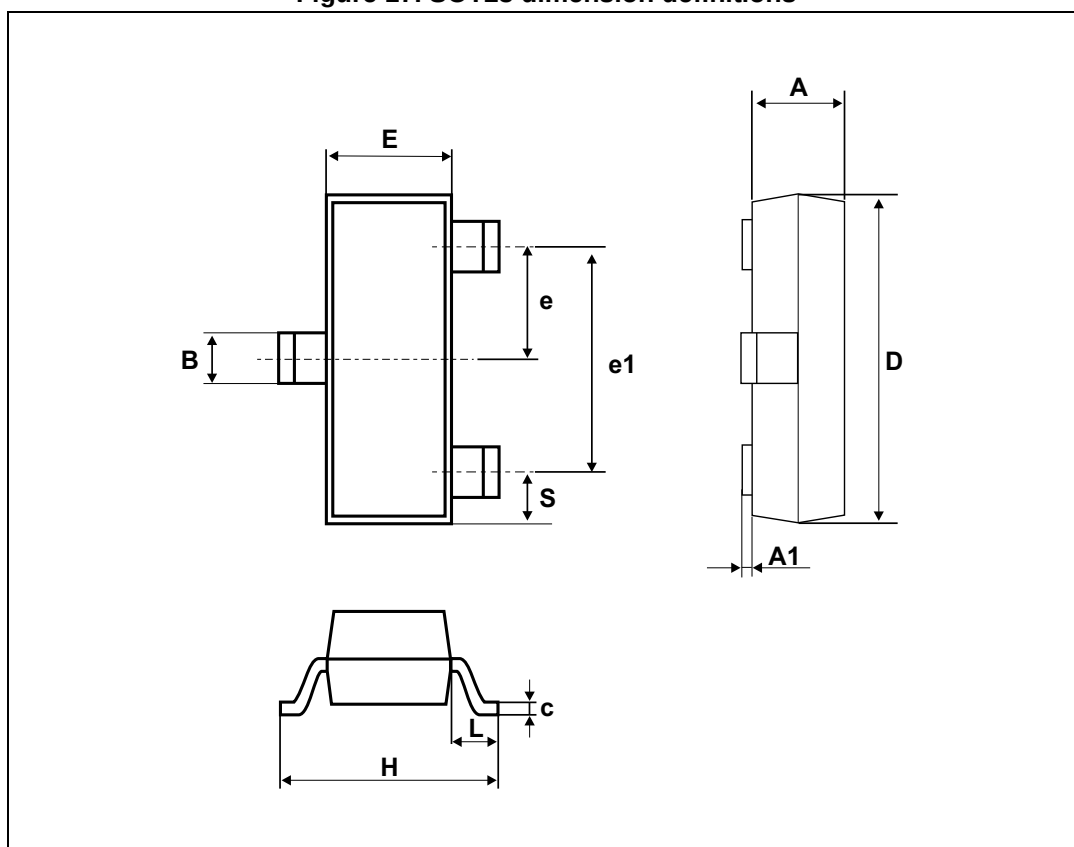


Table 9. SOT23 dimension values

| 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)

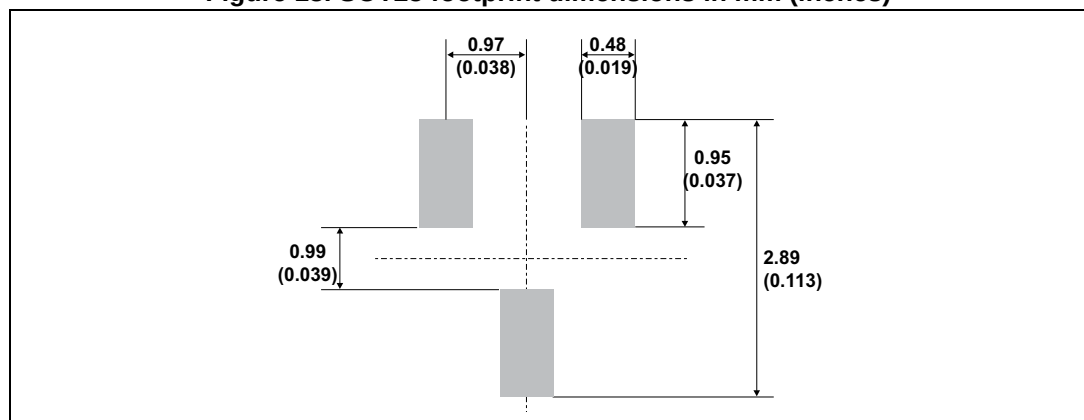


Figure 19. SOT-323 dimension definitions

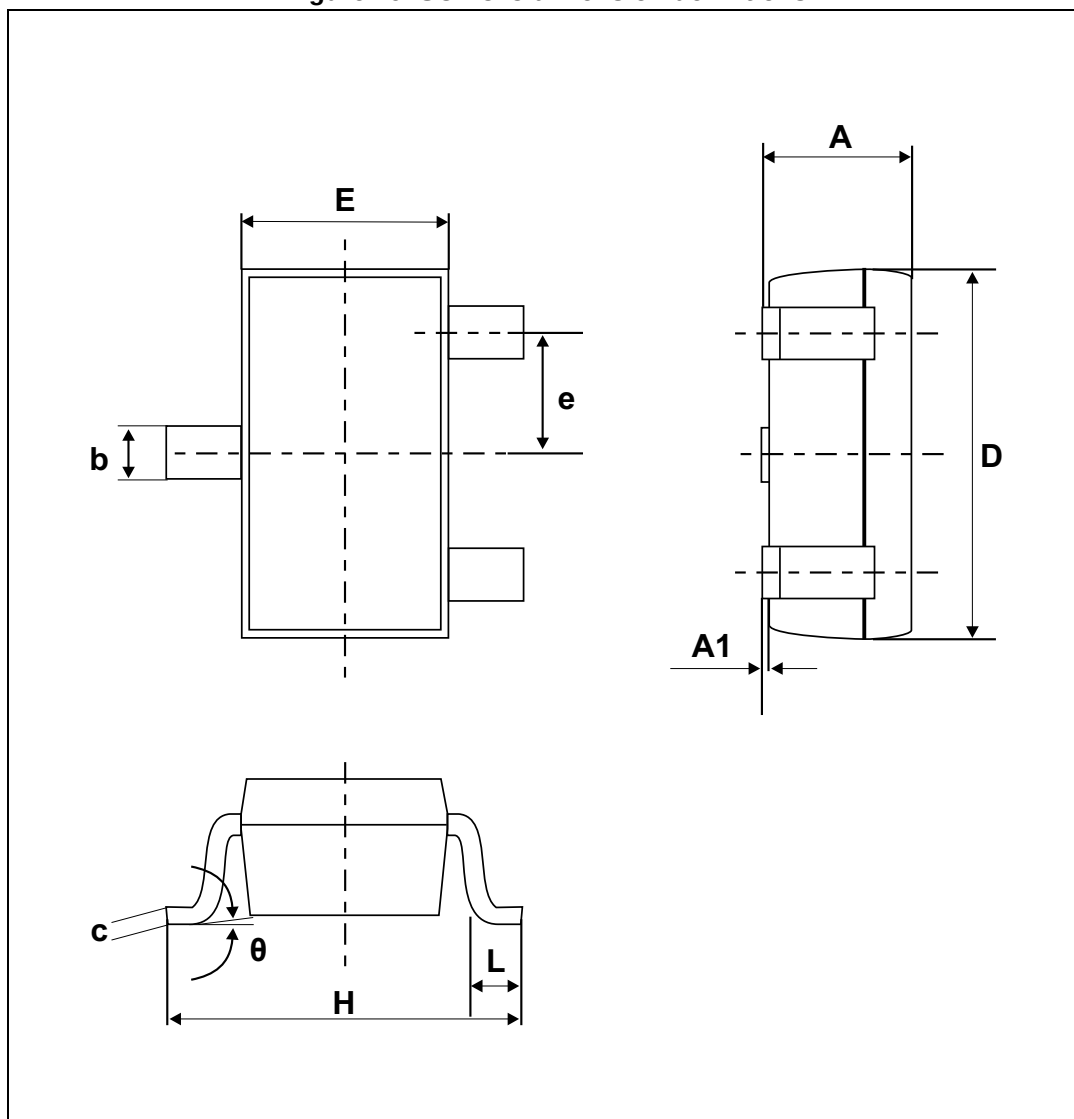
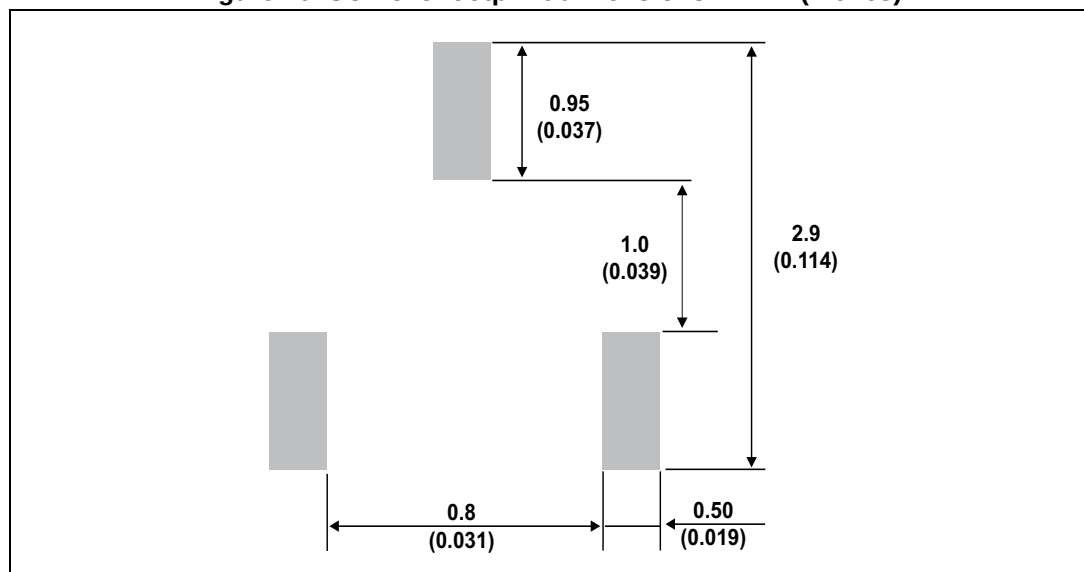


Table 10. SOT-323 dimension values

| 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

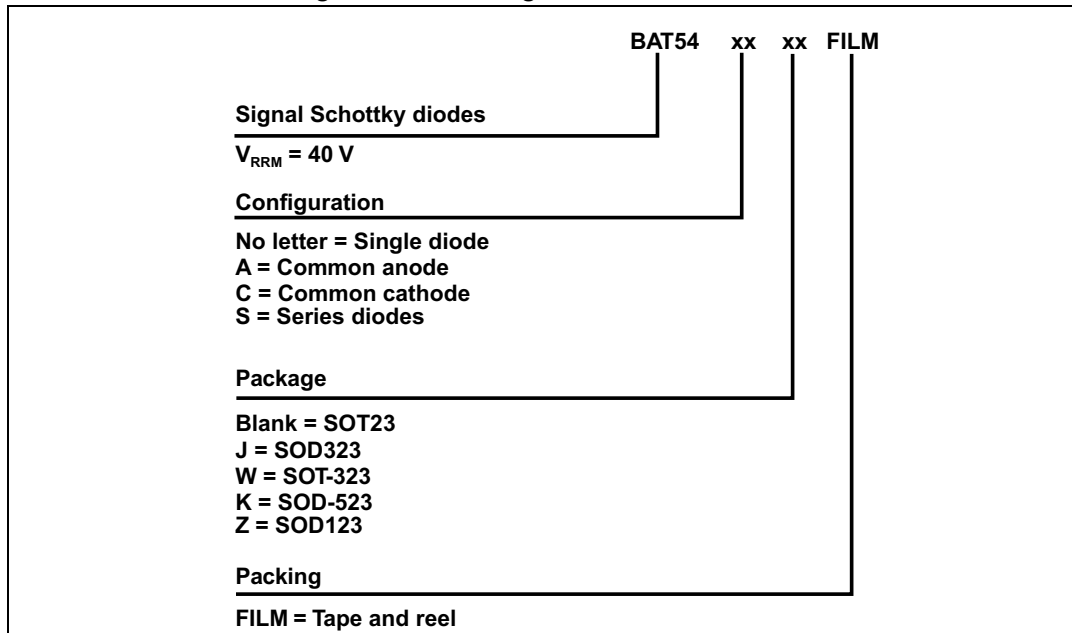


Table 11. Ordering information

| 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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