



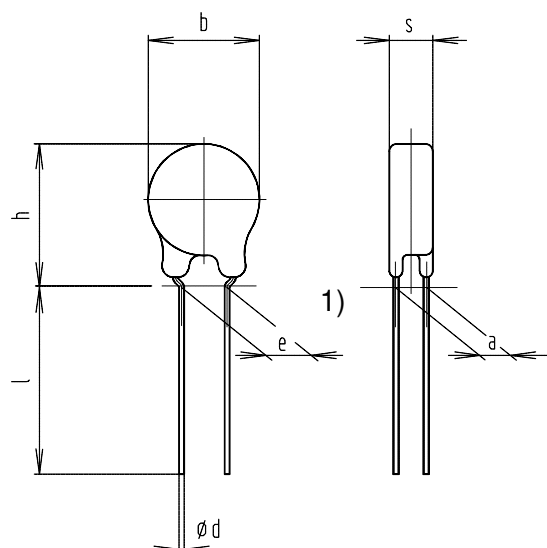
## Leaded Varistors

### Standard Series

|                       |                        |
|-----------------------|------------------------|
| <b>Series/Type:</b>   | <b>SIOV-S10K50G3S5</b> |
| <b>Ordering code:</b> | <b>B72210S0500K531</b> |
| Date:                 | 2005-09-22             |
| Version:              | a                      |

**SIOV nomenclature**

|    |   |   |
|----|---|---|
| S  | = | Disk type   |
| 10 | = | Rated disk diameter                               |
| K  | = | Tolerance of varistor voltage at 1mA : $\pm 10\%$ |
| 50 | = | Max. operating voltage $V_{rms}$                  |
| G3 | = | Taping based on IEC 60286-2                       |
| S5 | = | Crimp style S5                                    |

**Figure:** Dimensions given in Millimeters (mm)


|                 |   |                             |
|-----------------|---|-----------------------------|
| $b_{max}$       | = | 12,0                        |
| $h_{max}$       | = | 15,5                        |
| $s_{max}$       | = | 3,9                         |
| $e$             | = | $7,5 \pm 0,8$ <sup>2)</sup> |
| $a$             | = | $1,4 \pm 1,0$               |
| $l_{min}$       | = | n.a.                        |
| $\varnothing d$ | = | $0,8 \pm 0,05$              |

<sup>1)</sup> seating plane in accordance with IEC 60717

<sup>2)</sup> measured above carrier tape

**Electrical data:**

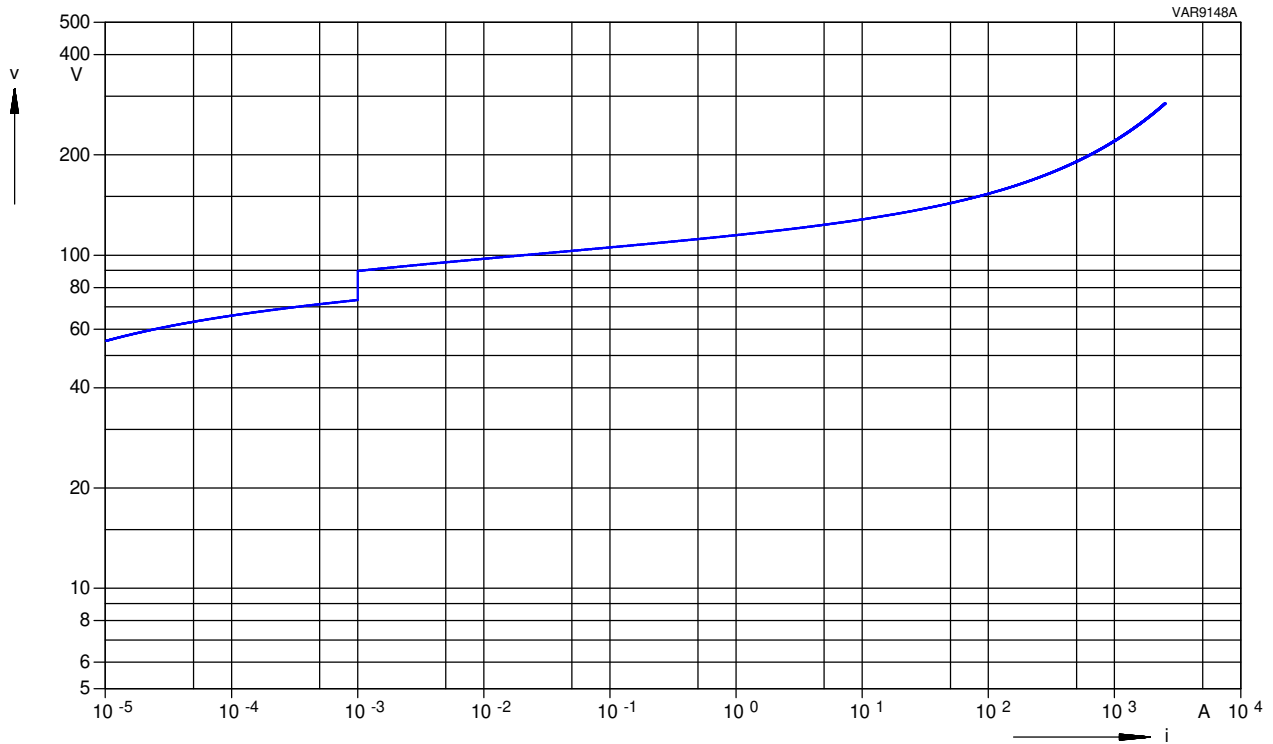
Maximum Ratings (T=85°C)

|                           |        |           |   |        |
|---------------------------|--------|-----------|---|--------|
| Max. operating AC voltage |        | $V_{RMS}$ | = | 50 V   |
| Max. operating DC voltage |        | $V_{DC}$  | = | 65 V   |
| Surge current (8/20µs)    | 1 time | $I_{max}$ | = | 2500 A |
| Energy absorption (2ms)   | 1 time | $W_{max}$ | = | 8,4 J  |
| Average power dissipation |        | $P_{max}$ | = | 0,40 W |

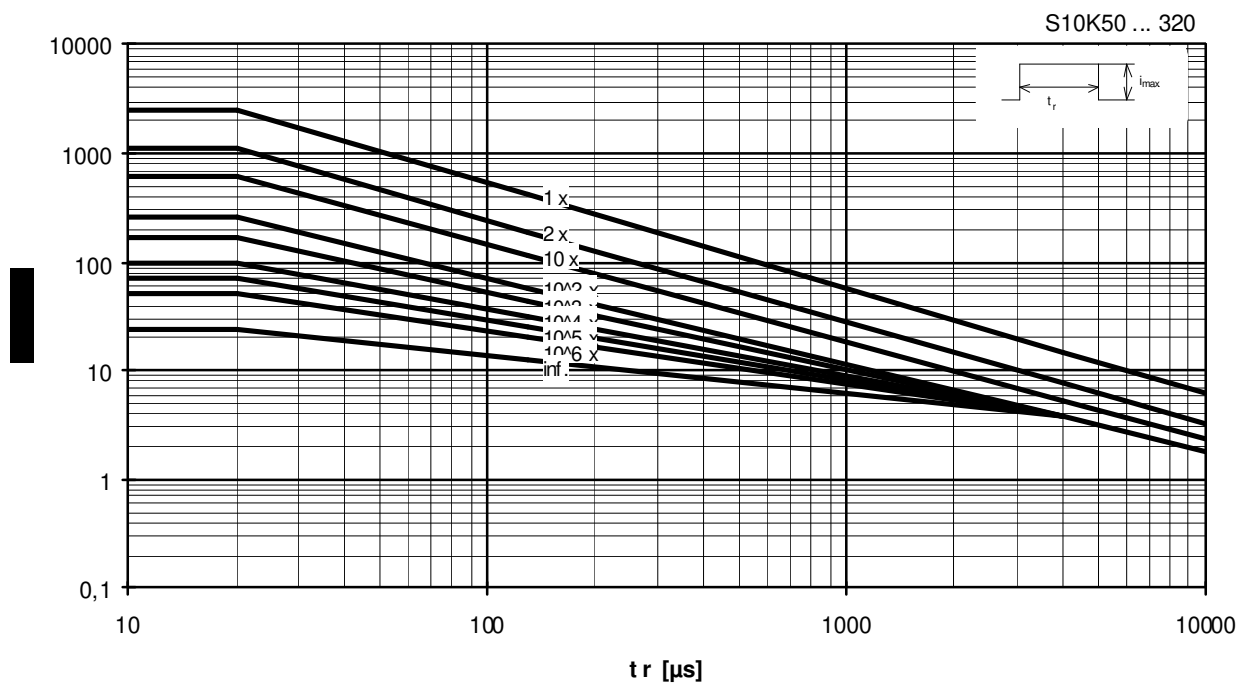
Characteristics (T=25°C)

|                                   |             |   |                 |
|-----------------------------------|-------------|---|-----------------|
| Varistor voltage at 1mA           | $V_V$       | = | $82 V \pm 10\%$ |
| Clamping voltage at 25 A (8/20µs) | $V_{C,max}$ | = | 135 V           |
| Typ. capacitance at 1 kHz         | C           | = | 950 pF          |

### V/I Characteristic:

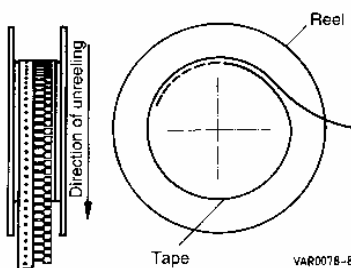
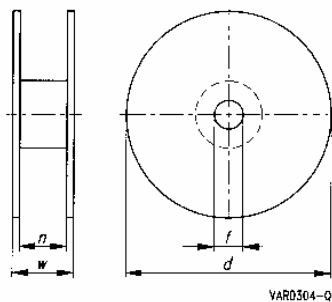


### Derating:



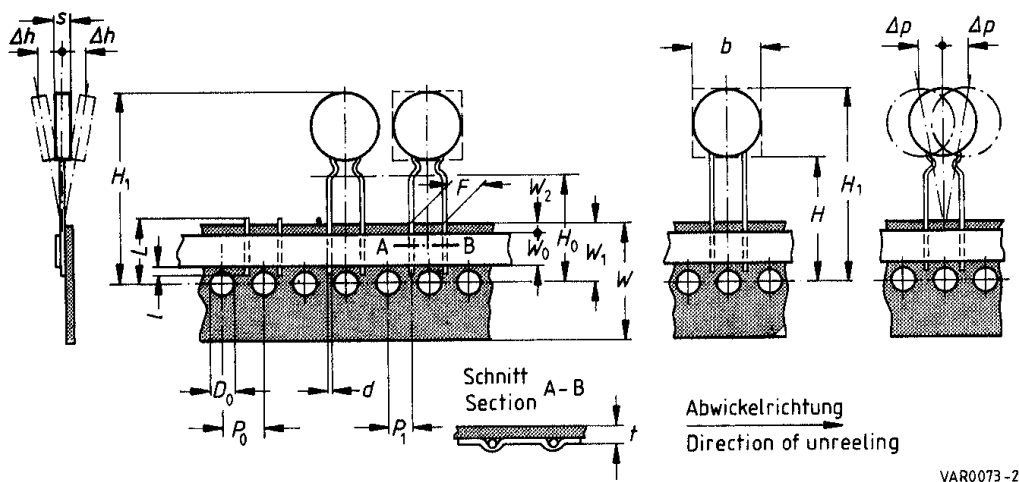
**Taping:**

Package Unit: 750 pcs./reel



|            |   |                       |
|------------|---|-----------------------|
| $d_{\max}$ | = | 360 mm                |
| $w_{\max}$ | = | 64 mm                 |
| $f$        | = | $31 \pm 1,0\text{mm}$ |
| $n$        | = | 55 mm (typ.)          |

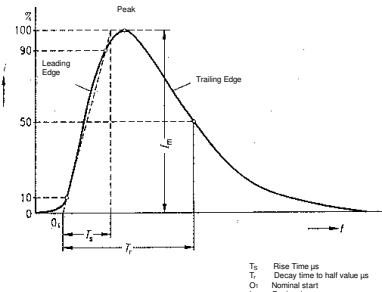
Lead spacing 7,5 mm



**Tape dimensions, in Millimeters (mm):**

| Definition                                       | Symbol         | Dimension | Tolerance    | Remarks                            |
|--|----------------|-----------|--------------|------------------------------------|
| Body diameter                                    | b              | 12,0      | max          |                                    |
| Body thickness                                   | s              | 3,9       | max          |                                    |
| Lead diameter                                    | d              | 0,8       | $\pm 0,05$   |                                    |
| Sprocket hole pitch                              | P <sub>0</sub> | 12,7      | $\pm 0,3$    | $\pm 1\text{mm}/20$ sprocket holes |
| Distance hole center to lead center              | P <sub>1</sub> | 8,95      | $\pm 0,8$    |                                    |
| Lead spacing                                     | F              | 7,5       | $\pm 0,8$    | measured above carrier tape        |
| Component deviation                              | $\Delta h$     |           |              | depends on s                       |
| Component deviation                              | $\Delta p$     | 0         | $\pm 2,0$    | measured at top of component body  |
| Carrier tape width                               | W              | 18,0      | $\pm 0,5$    |                                    |
| Adhesive tape width                              | W <sub>0</sub> | 11,0      | min          | Peel-off force $\geq 5\text{N}$    |
| Sprocket hole position                           | W <sub>1</sub> | 9,0       | $+0,75/-0,5$ |                                    |
| Adhesive tape position                           | W <sub>2</sub> | 3,0       | max          |                                    |
| Distance hole center to the top of the component | H <sub>1</sub> | 45,0      | max          |                                    |
| Seating plane height                             | H <sub>0</sub> | 16,0      | $\pm 0,5$    |                                    |
| Hole diameter                                    | D <sub>0</sub> | 4,0       | $\pm 0,2$    |                                    |
| Total tape thickness                             | t              | 0,9       | max          |                                    |
| Cutting level                                    | L              | 11,0      | max          |                                    |

**Reliability Data:**

|  | Characteristics                 | Test Methods/Description  | Specifications   |
|--|---------------------------------|---|--|
| E<br>L<br>E<br>C<br>T<br>R<br>I<br>C<br>A<br>L | Varistor Voltage                | The voltage between two terminals with the specified measuring current applied is called $V_V$ (1 mA <sub>DC</sub> @ 0.2 - 2 s).  | To meet the specified value.   |
|  | Clamping Voltage                | <p>The maximum voltage between two terminals with the specified standard impulse current (8/20µs) illustrated below applied.</p>  <p> <math>T_1</math> Rise Time <math>\mu</math>s<br/> <math>T_2</math> Decay time to half value <math>\mu</math>s<br/> <math>O_1</math> Nominal start<br/> <math>I_m</math> Peak value </p> | To meet the specified value.   |
|  | Surge current derating, 8/20 µs | 100 surge currents (8/20 µs), unipolar, interval 30 s, amplitude corresponding to derating curve for 20 µs  | $ \Delta V/V (1 \text{ mA})  \leq 10 \%$ (measured in direction of surge current)<br>No visible damage |
|  | Surge current derating, 2 ms    | 100 surge currents (2ms), unipolar, interval 120s, amplitude corresponding to derating curve for 2ms  | $ \Delta V/V (1 \text{ mA})  \leq 10 \%$ (measured in direction of surge current)<br>No visible damage |
|  |                                 |   |  |

|  | Characteristics  | Test Methods/Description   | Specifications           |              |        |     |        |      |        |      |        |      |   |
|--|--|--|--------------------------|--------------|--------|-----|--------|------|--------|------|--------|------|---|
| M<br><br>E<br><br>C<br><br>H<br><br>A<br><br>N<br><br>I<br><br>C<br><br>A<br><br>L | Tensile strength   | <p>After gradually applying the force specified below and keeping the unit fixed for 10 seconds, the terminal shall be visually examined for any damage.</p> <table><tr><td><u>Terminal diameter</u></td><td><u>Force</u></td></tr><tr><td>0.5 mm</td><td>5 N</td></tr><tr><td>0.6 mm</td><td>10 N</td></tr><tr><td>0.8 mm</td><td>10 N</td></tr><tr><td>1.0 mm</td><td>20 N</td></tr></table>   | <u>Terminal diameter</u> | <u>Force</u> | 0.5 mm | 5 N | 0.6 mm | 10 N | 0.8 mm | 10 N | 1.0 mm | 20 N | <p>  Δ V/V (1 mA)  <br/>≤ 5 %<br/>No break of solder joint, no wire break</p> |
|  | <u>Terminal diameter</u>   | <u>Force</u>   |                          |              |        |     |        |      |        |      |        |      |   |
|  | 0.5 mm   | 5 N  |                          |              |        |     |        |      |        |      |        |      |   |
|  | 0.6 mm   | 10 N   |                          |              |        |     |        |      |        |      |        |      |   |
|  | 0.8 mm   | 10 N   |                          |              |        |     |        |      |        |      |        |      |   |
| 1.0 mm   | 20 N   |  |                          |              |        |     |        |      |        |      |        |      |   |
| Vibration  | <p>After repeatedly applying a single harmonic vibration according to the table below. Thereafter, the unit shall be visually examined.</p> <p>frequency range: 10 .... 55 Hz<br/>amplitude: 0.75 mm or 98 m/s²<br/>duration: 6 h (3 x 2 h)<br/>pulse: sine wave</p> | <p>  Δ V/V (1 mA)  <br/>≤ 5 %<br/>No visible damage</p>  |                          |              |        |     |        |      |        |      |        |      |   |
| Solderability  | <p>After dipping the terminals to a depth of approximately 3 mm from the body in a soldering bath of 235°C for 5 seconds, the terminals shall be visually examined.</p>  | <p>The inspection shall be carried out under adequate light with normal eyesight or with the assistance of a magnifier capable of giving a magnification of 4 times to 10 times. The dipped surface shall be covered with a smooth and bright solder coating with no more than small amounts of scattered imperfections such as pinholes or un-wetted or de-wetted areas. These imperfections shall not be concentrated in one area.</p> |                          |              |        |     |        |      |        |      |        |      |   |

|  | Characteristics              | Test Methods/Description   | Specifications   |
|--|------------------------------|--|--|
| M<br>E<br>C<br>H<br>A<br><br>N<br>I<br>C<br>A<br>L | Resistance to soldering heat | Each lead shall be dipped into a solder bath having a temperature of $260 \pm 5^{\circ}\text{C}$ to a point 2.0 to 2.5 mm from the body of the unit, be held there for $10 \pm 1$ s and then be stored at room temperature and normal humidity for 1 to 2 hours. The change of $V_v$ and mechanical damages shall be examined.           | $ \Delta V/V (1 \text{ mA})  \leq 5 \%$<br>No visible damage |
|  | Electric strength            | 2500 V <sub>RMS</sub> , 10 s<br>The varistor is placed in a container holding $1.6 \pm 0.2$ mm diameter metal balls such that only the terminations of the varistor are protruding. The specified voltage shall be applied between both terminals of the specimen connected together and the electrode inserted between the metal balls. | No breakdown   |



|               | Characteristics                    | Test Methods/Description  | Specifications                           |                                    |               |   |             |            |   |                 |                  |   |            |            |
|---------------|------------------------------------|---|--|------------------------------------|---------------|---|-------------|------------|---|-----------------|------------------|---|------------|------------|
| ENVIRONMENTAL | Max. AC operating voltage          | After being continuously applied the maximum allowable voltage at $85 \pm 2^{\circ}\text{C}$ for 1000 hours, the specimen shall be stored at room temperature and normal humidity for 1 to 2 hours. Thereafter, the change of $V_v$ shall be measured.  | $ \Delta V/V (1 \text{ mA})  \leq 10 \%$ |                                    |               |   |             |            |   |                 |                  |   |            |            |
|               | Damp heat, steady state            | The specimen shall be subjected to $40 \pm 2^{\circ}\text{C}$ , 90 to 95 % r.H. for 56 days without load and then stored at room temperature and normal humidity for 1 to 2 hours. Thereafter, the change of $V_v$ shall be measured.   | $ \Delta V/V (1 \text{ mA})  \leq 10 \%$ |                                    |               |   |             |            |   |                 |                  |   |            |            |
|               | Climatic sequence                  | The specimen shall be subjected to:<br>a) dry heat at $+85^{\circ}\text{C}$ , 16 h<br>b) damp heat, 1st cycle: $55^{\circ}\text{C}$ , 93 % r.H., 24 h<br>c) cold, $-40^{\circ}\text{C}$ , 2 h<br>d) damp heat, additional<br>5 cycles: $55^{\circ}\text{C}$ , 93 % r.H., 24 h/cycle<br>Then the specimen shall be stored at room temperature and normal humidity for 1 to 2 hours. Thereafter, the change of $V_v$ shall be measured.   | $ \Delta V/V (1 \text{ mA})  \leq 10 \%$ |                                    |               |   |             |            |   |                 |                  |   |            |            |
|               | Fast temperature cycling           | The temperature cycle shown below shall be repeated 5 times. Then the specimen shall be stored at room temperature and normal humidity for 1 to 2 hours. The change of $V_v$ and mechanical damage shall be examined.<br><br><table><tr><th>Step</th><th>Temperature (<math>^{\circ}\text{C}</math>)</th><th>Period (min.)</th></tr><tr><td>1</td><td><math>-40 \pm 3</math></td><td><math>30 \pm 3</math></td></tr><tr><td>2</td><td>transition time</td><td><math>&lt; 10 \text{ s}</math></td></tr><tr><td>3</td><td><math>85 \pm 2</math></td><td><math>30 \pm 3</math></td></tr></table> | Step                                     | Temperature ( $^{\circ}\text{C}$ ) | Period (min.) | 1 | $-40 \pm 3$ | $30 \pm 3$ | 2 | transition time | $< 10 \text{ s}$ | 3 | $85 \pm 2$ | $30 \pm 3$ |
| Step          | Temperature ( $^{\circ}\text{C}$ ) | Period (min.)   |  |                                    |               |   |             |            |   |                 |                  |   |            |            |
| 1             | $-40 \pm 3$                        | $30 \pm 3$  |  |                                    |               |   |             |            |   |                 |                  |   |            |            |
| 2             | transition time                    | $< 10 \text{ s}$  |  |                                    |               |   |             |            |   |                 |                  |   |            |            |
| 3             | $85 \pm 2$                         | $30 \pm 3$  |  |                                    |               |   |             |            |   |                 |                  |   |            |            |

**Note:** More details can be found in the data book 'SIOV Metal Oxide Varistors', Ordering No. EPC: 62002-7600

## Important notes

The following applies to all products named in this publication:

1. Some parts of this publication contain **statements about the suitability of our products for certain areas of application**. These statements are based on our knowledge of typical requirements that are often placed on our products in the areas of application concerned. We nevertheless expressly point out **that such statements cannot be regarded as binding statements about the suitability of our products for a particular customer application**. As a rule, EPCOS is either unfamiliar with individual customer applications or less familiar with them than the customers themselves. For these reasons, it is always ultimately incumbent on the customer to check and decide whether an EPCOS product with the properties described in the product specification is suitable for use in a particular customer application.
2. We also point out that **in individual cases, a malfunction of passive electronic components or failure before the end of their usual service life cannot be completely ruled out in the current state of the art, even if they are operated as specified**. In customer applications requiring a very high level of operational safety and especially in customer applications in which the malfunction or failure of a passive electronic component could endanger human life or health (e.g. in accident prevention or life-saving systems), it must therefore be ensured by means of suitable design of the customer application or other action taken by the customer (e.g. installation of protective circuitry or redundancy) that no injury or damage is sustained by third parties in the event of malfunction or failure of a passive electronic component.
3. **The warnings, cautions and product-specific notes must be observed.**
4. In order to satisfy certain technical requirements, **some of the products described in this publication may contain substances subject to restrictions in certain jurisdictions (e.g. because they are classed as “hazardous”)**. Useful information on this will be found in our Material Data Sheets on the Internet ([www.epcos.com/material](http://www.epcos.com/material)). Should you have any more detailed questions, please contact our sales offices.
5. We constantly strive to improve our products. Consequently, **the products described in this publication may change from time to time**. The same is true of the corresponding product specifications. Please check therefore to what extent product descriptions and specifications contained in this publication are still applicable before or when you place an order.  
  
We also **reserve the right to discontinue production and delivery of products**. Consequently, we cannot guarantee that all products named in this publication will always be available.
6. Unless otherwise agreed in individual contracts, **all orders are subject to the current version of the “General Terms of Delivery for Products and Services in the Electrical Industry” published by the German Electrical and Electronics Industry Association (ZVEI)**.
7. The trade names EPCOS, CeraDiode, CSSP, PhaseCap, PhaseMod, SIFI, SIKOREL, SilverCap, SIMID, SIOV, SIP5D, SIP5K, TOPcap, UltraCap, WindCap are **trademarks registered or pending** in Europe and in other countries. Further information will be found on the Internet at [www.epcos.com/trademarks](http://www.epcos.com/trademarks).