Multilayer Ceramic Capacitors

Series/Type: B37937, B37947

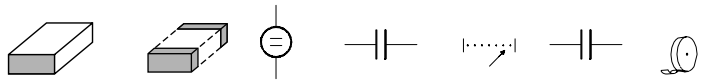
The following products presented in this data sheet are being withdrawn.

Ordering Code	Substitute Product	Date of Withdrawal	Deadline Last Orders	Last Shipments
B37947K9102J060		2007-12-21	2008-03-31	2008-06-30
B37947K9102J070		2007-12-21	2008-03-31	2008-06-30
B37947K9152J060		2007-12-21	2008-03-31	2008-06-30

Ordering Code	Substitute Product	Date of Withdrawal	Deadline Last Orders	Last Shipments
B37947K9152J070		2007-12-21	2008-03-31	2008-06-30
B37947K9222J062		2007-12-21	2008-03-31	2008-06-30
B37947K9222J072		2007-12-21	2008-03-31	2008-06-30
B37947K9472J062		2007-12-21	2008-03-31	2008-06-30
B37947K9472J072		2007-12-21	2008-03-31	2008-06-30
B37937K9561J060		2007-12-21	2008-03-31	2008-06-30
B37937K9561J070		2007-12-21	2008-03-31	2008-06-30
B37937K9681J060		2007-12-21	2008-03-31	2008-06-30
B37937K9681J070		2007-12-21	2008-03-31	2008-06-30
B37937K9102J060		2007-12-21	2008-03-31	2008-06-30
B37937K9102J070		2007-12-21	2008-03-31	2008-06-30
B37947K9103G*		2007-10-26	2008-01-31	2008-04-30
B37947K9103F*		2007-10-26	2008-01-31	2008-04-30
B37947K9682G*		2007-10-26	2008-01-31	2008-04-30
B37947K9562J*		2007-10-26	2008-01-31	2008-04-30
B37937K9227J*		2007-10-26	2008-01-31	2008-04-30
B37937K9222G*		2007-10-26	2008-01-31	2008-04-30
B37937K9182J*		2007-10-26	2008-01-31	2008-04-30
B37947K9682J072		2007-10-26	2008-01-31	2008-04-30
B37947K9682J062		2007-10-26	2008-01-31	2008-04-30
B37947K9332J072		2007-10-26	2008-01-31	2008-04-30
B37947K9332J062		2007-10-26	2008-01-31	2008-04-30
B37947K9103J072		2007-10-26	2008-01-31	2008-04-30
B37947K9103J062		2007-10-26	2008-01-31	2008-04-30
B37937K9222J070		2007-10-26	2008-01-31	2008-04-30
B37937K9222J060		2007-10-26	2008-01-31	2008-04-30
B37937K9152J070		2007-10-26	2008-01-31	2008-04-30
B37937K9152J060		2007-10-26	2008-01-31	2008-04-30

For further information please contact your nearest EPCOS sales office, which will also support you in selecting a suitable substitute. The addresses of our worldwide sales network are presented at www.epcos.com/sales.

Ordering code system



B37937 K 9 102 J 0 60

Packaging

60 ≙ cardboard tape, 180-mm reel
62 ≙ blister tape, 180-mm reel
70 ≙ cardboard tape, 330-mm reel
72 ≙ blister tape, 330-mm reel

Internal coding

Capacitance tolerance

J ≙ ± 5% (standard)
K ≙ ±10%

Capacitance, coded (example)
102 ≙ 10 · 10^2 pF = 1 nF
103 ≙ 10 · 10^3 pF = 10 nF

Rated voltage

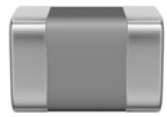
Rated voltage [VDC]	16
Code	9

Termination K ≙ nickel barrier for all case sizes

Type and size	
Chip size (**inch** / mm)	Temperature characteristic CPPS
0603 / 1608 **0805** / 2012	B37937 B37947

CPPS

SMD



Features

- Replacement of PPS film capacitors
- Class 1 characteristic with high capacitance values
- High insulation resistance
- Excellent DC characteristic
- Excellent temperature characteristic
- No piezoelectric effects
- No ageing effects

Applications

- Wireless communication
- Loop filter
- PLL filter
- Telecom (mobile phones, Bluetooth, ADSL/XDSL)
- Automotive (keyless entry)

Termination

- For soldering: Nickel barrier terminations (Ni)

Options

- Alternative capacitance tolerances available on request

Delivery mode

- Cardboard and blister tape (blister tape for chip thickness ≥1.2 ±0.1 mm), 180-mm and 330-mm reel available

Electrical data

Temperature characteristic		C0G	
Climatic category (IEC 60068-1)		55/125/56	
Standard		EIA	
Dielectric		Class 1	
Rated voltage	V_R	16	VDC
Test voltage	V_{test}	$2.5 \cdot V_R$/5 s	VDC
Capacitance range / E series	C_R	560 pF … 10 nF (E6)	
Temperature coefficient		$0 \pm 30 \cdot 10^{-6}$/K	
Dissipation factor (limit value)	tan δ	$<1.0 \cdot 10^{-3}$	
Insulation resistance[1)] at + 25 °C	R_{ins}	$>10^5$	MΩ
Insulation resistance[1)] at +125 °C	R_{ins}	$>10^4$	MΩ
Time constant[1)] at + 25 °C	τ	>1000	s
Time constant[1)] at +125 °C	τ	>100	s
Operating temperature range	T_{op}	–55 … +125	°C
Ageing		none	

1) For C_R >10 nF the time constant $\tau = C \cdot R_{ins}$ is given.

CPPS

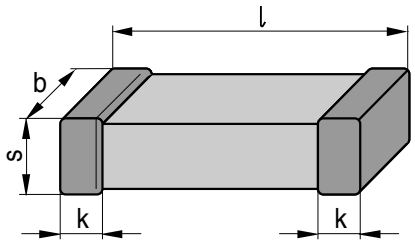
Multilayer ceramic capacitors

CPPS

Capacitance tolerances

Code letter	J (standard)	K
Tolerance	±5%	±10%

Dimensional drawing



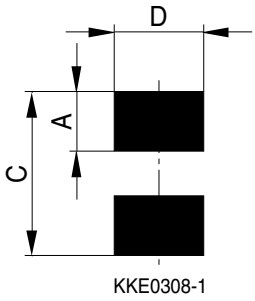
KKE0329-N

Dimensions (mm)

Case size (inch) (mm)	0603 1608	0805 2012
l	1.6 ±0.15	2.00 ±0.20
b	0.8 ±0.10	1.25 ±0.15
s	0.8 ±0.10	1.30 max.
k	0.1 –0.40	0.13 –0.75

Tolerances to CECC 32101-801

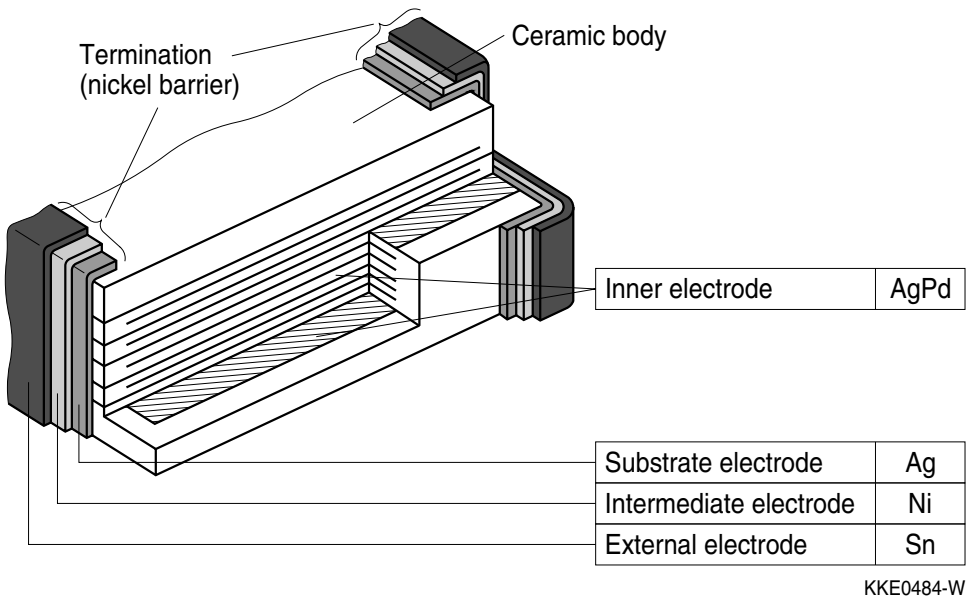
Recommended solder pad



Recommended dimensions (mm) for reflow soldering

Case size	(inch/mm)	Type	A	C	D
	0603/1608	single chip	0.6 … 0.7	1.8 … 2.2	0.6 … 0.8
	0805/2012	single chip	0.6 … 0.7	2.2 … 2.6	0.8 … 1.1

Termination



Product range for CPPS chip capacitors

Size[1)] **inch** / mm	**0603** 1608		**0805** 2012	
Type	B37937		B37947	
V_R (VDC) / C_R	16		16	
560 pF	■			
680 pF	■			
1.0 nF	■		■	
1.5 nF	■		■	
2.2 nF	■		■	
3.3 nF			■	
4.7 nF			■	
6.8 nF			■	
10 nF			■	

1) l × b (inch) / l × b (mm)

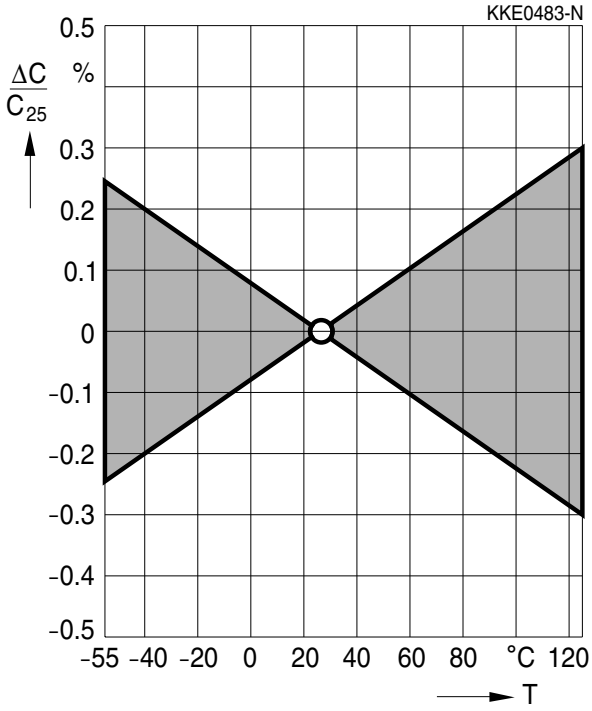
Ordering codes and packing for CPPS capacitors, 16 VDC, nickel barrier terminations

C_R[1]	Ordering code[2]	Chip thickness mm	Cardboard tape, ∅ 180-mm reel ** ≙ 60 pcs/reel	Cardboard tape, ∅ 330-mm reel ** ≙ 70 pcs/reel
Case size 0603, 16 VDC				
560 pF	B37937K9561J0**	0.8 ±0.1	4000	16000
680 pF	B37937K9681J0**	0.8 ±0.1	4000	16000
1.0 nF	B37937K9102J0**	0.8 ±0.1	4000	16000
1.5 nF	B37937K9152J0**	0.8 ±0.1	4000	16000
2.2 nF	B37937K9222J0**	0.8 ±0.1	4000	16000
Case size 0805, 16 VDC				
1.0 nF	B37947K9102J0**	0.6 ±0.1	5000	20000
1.5 nF	B37947K9152J0**	0.8 ±0.1	4000	16000
2.2 nF	B37947K9222J0**	1.2 ±0.1	3000[3]	12000[4]
3.3 nF	B37947K9332J0**	1.2 ±0.1	3000[3]	12000[4]
4.7 nF	B37947K9472J0**	1.2 ±0.1	3000[3]	12000[4]
6.8 nF	B37947K9682J0**	1.2 ±0.1	3000[3]	12000[4]
10 nF	B37947K9103J0**	1.2 ±0.1	3000[3]	12000[4]

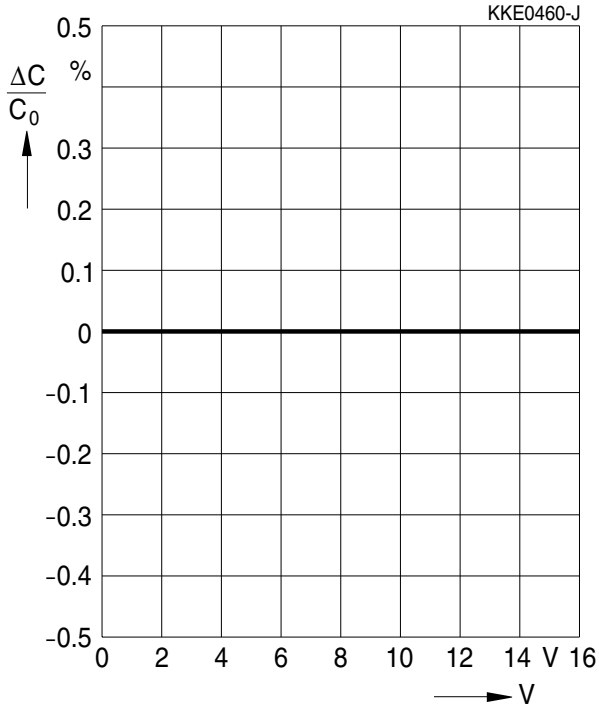
1) Other capacitance values on request.
2) The table contains the ordering codes for the standard capacitance tolerance. For other available capacitance tolerances see page 168.
3) Blister tape, 180-mm reel, ordering code ** ≙ 62
4) Blister tape, 330-mm reel, ordering code ** ≙ 72

Typical characteristics[1)]

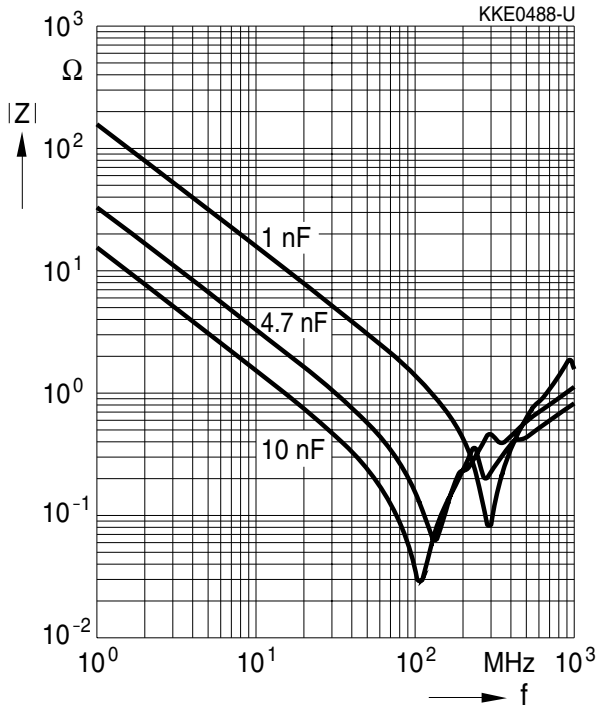
Capacitance change $\Delta C/C_{25}$ versus temperature T (tolerance range ▭)



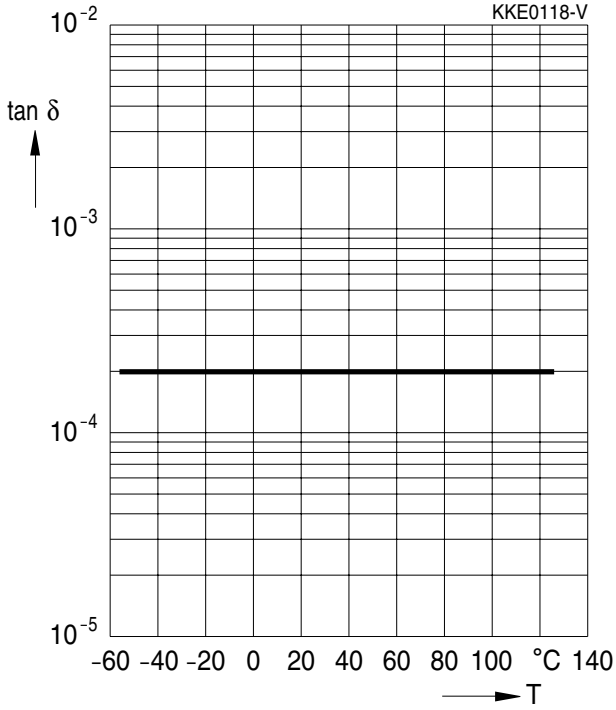
Capacitance change $\Delta C/C_0$ versus superimposed DC voltage V



Impedance |Z| versus frequency f



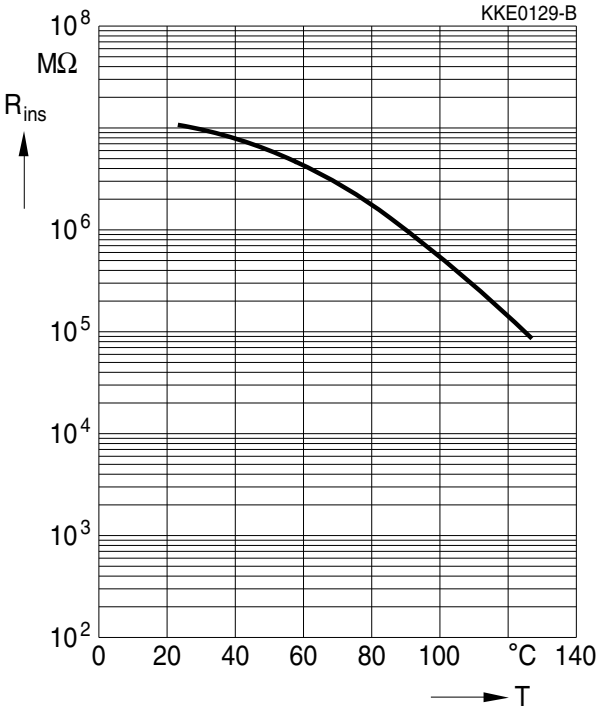
Dissipation factor tan δ versus temperature T



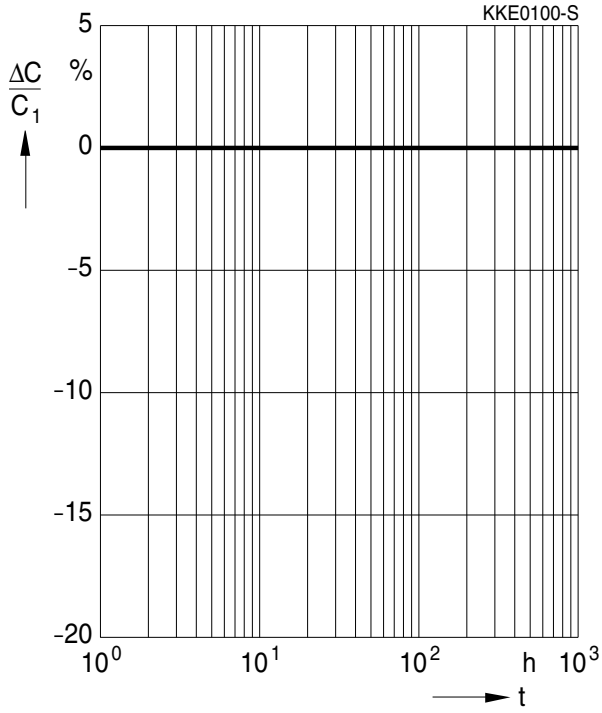
1) For more detailed information on frequency behavior and characteristics see www.epcos.com/mlcc_impedance.

Typical characteristics[1)]

Insulation resistance R_{ins} versus temperature T



Capacitance change $\Delta C/C_1$ versus time t



1) For more detailed information on frequency behavior and characteristics see www.epcos.com/mlcc_impedance.

Notes on the selection of ceramic capacitors

In the selection of ceramic capacitors, the following criteria must be considered:

1. Depending on the application, ceramic capacitors used to meet high quality requirements should at least satisfy the specifications to AEC-Q200. They must meet quality requirements going beyond this level in terms of ruggedness (e.g. mechanical, thermal or electrical) in the case of critical circuit configurations and applications (e.g. in safety-relevant applications such as ABS and airbag equipment or durable industrial goods).
2. At the connection to the battery or power supply (e.g. clamp 15 or 30 in the automobile) and at positions with stranding potential, to reduce the probability of short circuits following a fracture, two ceramic capacitors must be connected in series and/or a ceramic capacitor with integrated series circuit should be used. The MLSC from EPCOS contains such a series circuit in a single component.
3. Ceramic capacitors with the temperature characteristics Z5U and Y5V do not satisfy the requirements to AEC-Q200 and are mechanically and electrically less rugged than C0G or X7R/X8R ceramic capacitors. In applications that must satisfy high quality requirements, therefore, these capacitors should not be used as discrete components (see the chapter “Effects on mechanical, thermal and electrical stress”, point 1.4).
4. For ESD protection, preference should be given to the use of multilayer varistors (MLV) (see the chapter “Effects on mechanical, thermal and electrical stress”, point 1.4).
5. An application-specific derating or continuous operating voltage must be considered in order to cushion (unexpected) additional stresses (see the chapter “Reliability”).

The following should be considered in circuit board design

1. If technically feasible in the application, preference should be given to components having an optimal geometrical design.
2. At least FR4 circuit board material should be used.
3. Geometrically optimal circuit boards should be used, ideally those that cannot be deformed.
4. Ceramic capacitors must always be placed a sufficient minimum distance from the edge of the circuit board. High bending forces may be exerted there when the panels are separated and during further processing of the board (such as when incorporating it into a housing).
5. Ceramic capacitors should always be placed parallel to the possible bending axis of the circuit board.
6. No screw connections should be used to fix the board or to connect several boards. Components should not be placed near screw holes. If screw connections are unavoidable, they must be cushioned (for instance by rubber pads).

The following should be considered in the placement process

1. Ensure correct positioning of the ceramic capacitor on the solder pad.
2. Caution when using casting, injection-molded and molding compounds and cleaning agents, as these may damage the capacitor.
3. Support the circuit board and reduce the placement forces.
4. A board should not be straightened (manually) if it has been distorted by soldering.
5. Separate panels with a peripheral saw, or better with a milling head (no dicing or breaking).
6. Caution in the subsequent placement of heavy or leaded components (e.g. transformers or snap-in components): danger of bending and fracture.
7. When testing, transporting, packing or incorporating the board, avoid any deformation of the board not to damage the components.
8. Avoid the use of excessive force when plugging a connector into a device soldered onto the board.
9. Ceramic capacitors must be soldered only by the mode (reflow or wave soldering) permissible for them (see the chapter “Soldering directions”).
10. When soldering the most gentle solder profile feasible should be selected (heating time, peak temperature, cooling time) in order to avoid thermal stresses and damage.
11. Ensure the correct solder meniscus height and solder quantity.
12. Ensure correct dosing of the cement quantity.
13. Ceramic capacitors with an AgPd external termination are not suited for the lead-free solder process: they were developed only for conductive adhesion technology.

This listing does not claim to be complete, but merely reflects the experience of EPCOS AG.

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). 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, EPCOS-JONES, Baoke, CeraDiode, CSSP, MLSC, PhaseCap, PhaseMod, SIFERRIT, SIFI, SIKOREL, SilverCap, SIMID, SIOV, SIP5D, SIP5K, 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.