



Multilayer Ceramic Capacitors

Series/Type: Z5U (Y5U)

The following products presented in this data sheet are being withdrawn.

Ordering Code	Substitute Product	Date of Withdrawal	Deadline Last Orders	Last Shipments
B37957J5475M072		16.03.2007	30.06.2007	30.09.2007
B37957J5475M062	B37953K5474K062	16.03.2007	30.06.2007	30.09.2007
B37957J5225M072		16.03.2007	30.06.2007	30.09.2007



Ordering Code	Substitute Product	Date of Withdrawal	Deadline Last Orders	Last Shipments
B37957J5225M062		16.03.2007	30.06.2007	30.09.2007
B37957J5105M072		16.03.2007	30.06.2007	30.09.2007
B37957J5105M062		16.03.2007	30.06.2007	30.09.2007
B37954J5155M072		16.03.2007	30.06.2007	30.09.2007
B37954J5155M062		16.03.2007	30.06.2007	30.09.2007
B37954J5105M072		16.03.2007	30.06.2007	30.09.2007
B37954J5105M062		16.03.2007	30.06.2007	30.09.2007
B37954J5684M072		16.03.2007	30.06.2007	30.09.2007
B37954J5684M062		16.03.2007	30.06.2007	30.09.2007
B37951K5105M072		16.03.2007	30.06.2007	30.09.2007
B37951K5105M062		16.03.2007	30.06.2007	30.09.2007
B37951K5474M072		16.03.2007	30.06.2007	30.09.2007
B37951K5474M062		16.03.2007	30.06.2007	30.09.2007
B37873K5474M072		16.03.2007	30.06.2007	30.09.2007
B37873K5474M062	B37872K5474K062	16.03.2007	30.06.2007	30.09.2007
B37873K5224M070		16.03.2007	30.06.2007	30.09.2007
B37873K5224M060	B37872K5224K062	16.03.2007	30.06.2007	30.09.2007
B37873K5104M070	B37872K5104M070	16.03.2007	30.06.2007	30.09.2007
B37873K5104M060	B37872K5104M060	16.03.2007	30.06.2007	30.09.2007
B37873K0105M072		16.03.2007	30.06.2007	30.09.2007
B37873K0105M062		16.03.2007	30.06.2007	30.09.2007
B37942K5104M070		16.03.2007	30.06.2007	30.09.2007
B37942K5104M060	B37941K104M060	16.03.2007	30.06.2007	30.09.2007
B37942K5473M001		16.03.2007	30.06.2007	30.09.2007
B37942K5473M070		16.03.2007	30.06.2007	30.09.2007
B37942K5473M060		16.03.2007	30.06.2007	30.09.2007
B37942K5223M001		16.03.2007	30.06.2007	30.09.2007
B37942K5223M070		16.03.2007	30.06.2007	30.09.2007
B37942K5223M060		16.03.2007	30.06.2007	30.09.2007
B37942K5103M001		16.03.2007	30.06.2007	30.09.2007
B37942K5103M070		16.03.2007	30.06.2007	30.09.2007
B37942K5103M060		16.03.2007	30.06.2007	30.09.2007
B37942K0224M070		16.03.2007	30.06.2007	30.09.2007
B37942K0224M060	B37941K224K060	16.03.2007	30.06.2007	30.09.2007
B37942K0154M070		16.03.2007	30.06.2007	30.09.2007
B37942K0154M060		16.03.2007	30.06.2007	30.09.2007
B37932K5473M001		16.03.2007	30.06.2007	30.09.2007
B37932K5473M070		16.03.2007	30.06.2007	30.09.2007

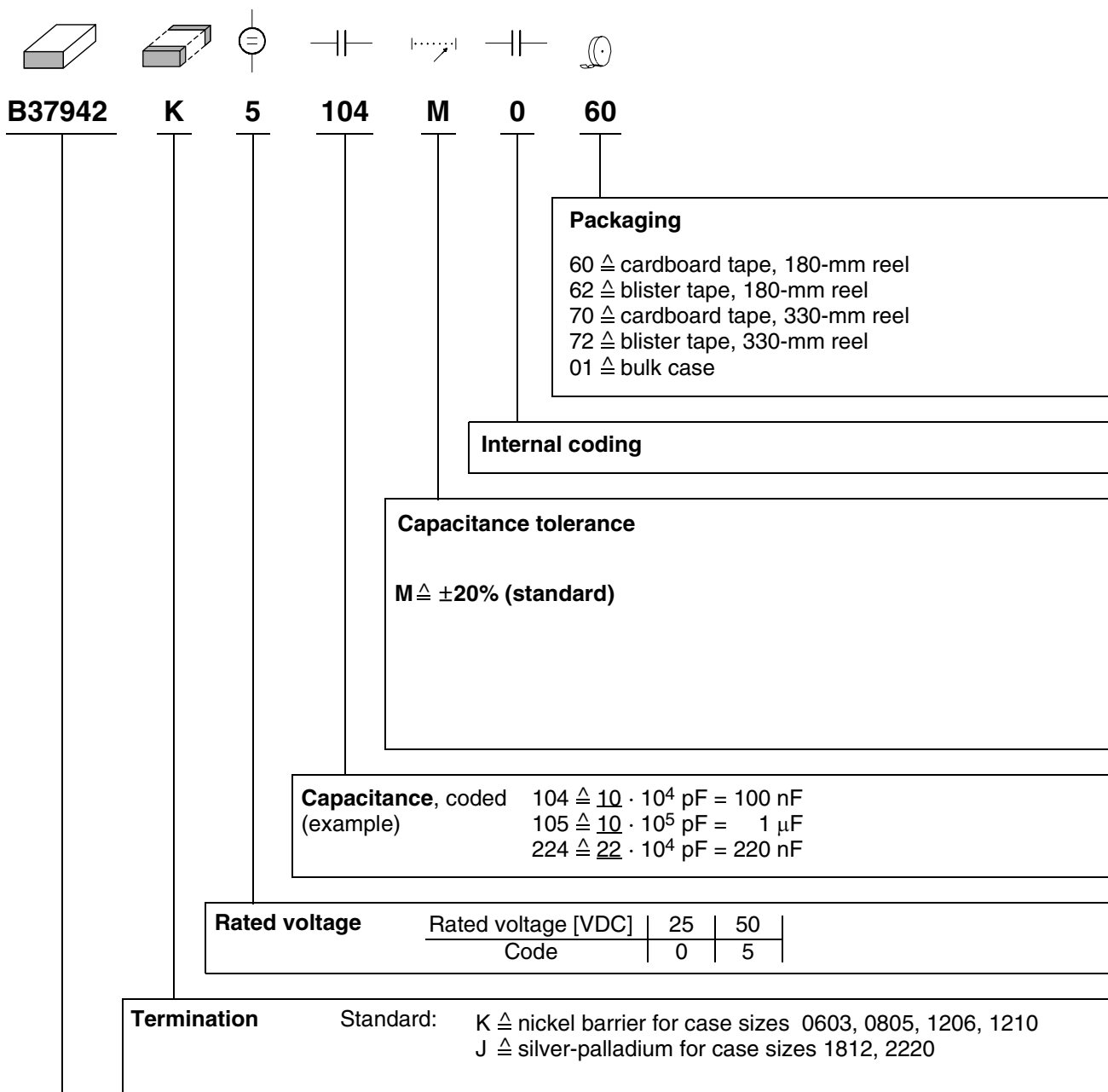


Ordering Code	Substitute Product	Date of Withdrawal	Deadline Last Orders	Last Shipments
B37932K5473M060		16.03.2007	30.06.2007	30.09.2007
B37932K5223M001		16.03.2007	30.06.2007	30.09.2007
B37932K5223M070		16.03.2007	30.06.2007	30.09.2007
B37932K5223M060		16.03.2007	30.06.2007	30.09.2007
B37932K5103M001		16.03.2007	30.06.2007	30.09.2007
B37932K5103M070		16.03.2007	30.06.2007	30.09.2007
B37932K5103M060		16.03.2007	30.06.2007	30.09.2007
B37932K0104M001		16.03.2007	30.06.2007	30.09.2007
B37932K0104M070		16.03.2007	30.06.2007	30.09.2007
B37932K0104M060	B37931K0104K060	16.03.2007	30.06.2007	30.09.2007

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.

Z5U (Y5U)

Ordering code system



Type and size	
Chip size (inch / mm)	Temperature characteristic Z5U (Y5U)
0603 / 1608	B37932
0805 / 2012	B37942
1206 / 3216	B37873
1210 / 3225	B37951
1812 / 4532	B37954
2220 / 5750	B37957

Z5U (Y5U)
SMD
Features

- Extremely high volumetric efficiency
- Non-linear capacitance change
- Y5U characteristic is also fulfilled


Applications

- Blocking
- Coupling
- Decoupling
- Interference suppression


Termination

- For soldering: Nickel barrier termination (Ni) for case sizes 0603 to 1210
Silver-palladium termination (AgPd) for case sizes 1812 and 2220

Delivery mode

- Cardboard and blister tape (blister tape for chip thickness $\geq 1.2 \pm 0.1$ mm and case sizes ≥ 1210), 180-mm and 330-mm reel available
- Bulk case for case sizes 0603 and 0805 (≥ 68 nF)

Electrical data

Temperature characteristic		Z5U (Y5U) ¹⁾	
Max. relative capacitance change within -30 °C to $+85$ °C	$\Delta C/C$	+22/–56	%
Climatic category (IEC 60068-1)		30/85/56	
Standard		EIA	
Dielectric		Class 2	
Rated voltage ²⁾	V_R	25, 50	VDC
Test voltage	V_{test}	$2.5 \cdot V_R/5$ s	VDC
Capacitance range	C_R	10 nF ... 4.7 μ F	
Dissipation factor (limit value)	$\tan \delta$	$< 50 \cdot 10^{-3}$	
Insulation resistance ³⁾ at $+25$ °C	R_{ins}	$> 10^4$	M Ω
Time constant ³⁾ at $+25$ °C	τ	> 500	s
Operating temperature range	T_{op}	$-30 \dots +85$	°C
Ageing ⁴⁾		yes	

1) Y5U specification is also fulfilled.

2) Note: No operation on AC line.

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

4) Refer to chapter "General technical information", "Ageing".

Z5U
(Y5U)

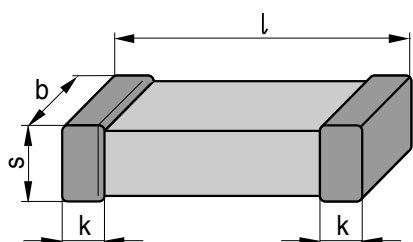
Multilayer ceramic capacitors

Z5U (Y5U)

Capacitance tolerances

Code letter	M (standard)
Tolerance	±20%

Dimensional drawing



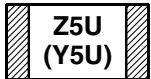
KKE0329-N

Dimensions (mm)

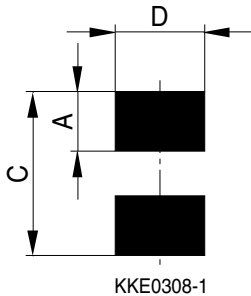
Case size (inch) (mm)	0603 1608	0805 2012	1206 3216	1210 3225
<i>l</i>	1.6 ±0.15	2.00 ±0.20	3.2 ±0.20	3.2 ±0.30
<i>b</i>	0.8 ±0.10	1.25 ±0.15	1.6 ±0.15	2.5 ±0.30
<i>s</i>	0.8 ±0.10	1.30 max.	1.30 max.	1.30 max.
<i>k</i>	0.1 –0.4	0.13 –0.75	0.25 –0.75	0.25 –0.75

Case size (inch) (mm)	1812 4532	2220 5750
<i>l</i>	4.5 ±0.30	5.7 ±0.40
<i>b</i>	3.2 ±0.30	5.0 ±0.40
<i>s</i>	1.30 max.	1.30 max.
<i>k</i>	0.25 –1.0	0.25 –1.0

Tolerances to CECC 32101-801



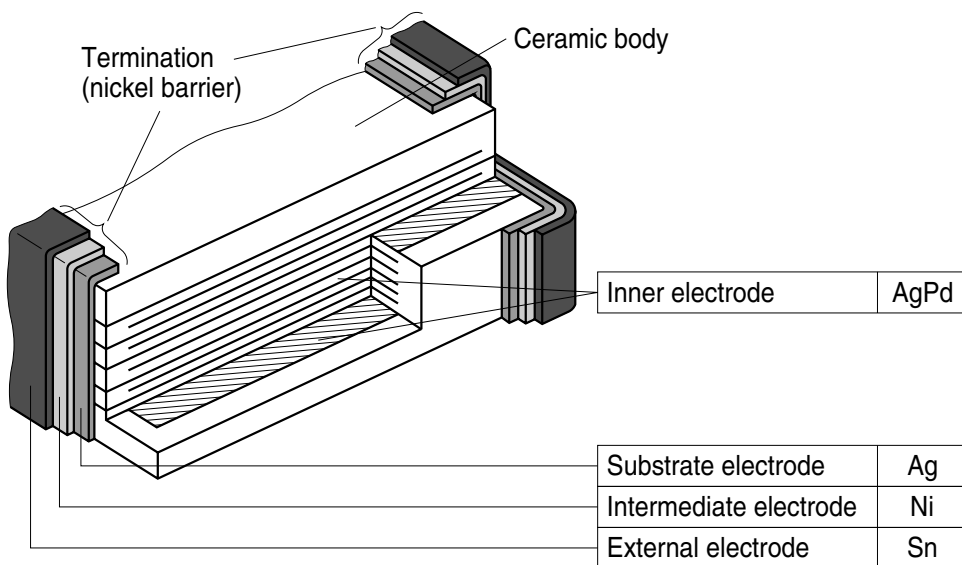
Recommended solder pad



Recommended dimensions (mm) for reflow soldering

Case size (inch/mm)	Type	A	C	D
0603/1608	single chip	0.6 ... 0.7	1.8 ... 2.20	0.6 ... 0.8
0805/2012	single chip	0.6 ... 0.7	2.2 ... 2.60	0.8 ... 1.1
1206/3216	single chip	0.8 ... 0.9	3.8 ... 4.32	1.0 ... 1.4
1210/3225	single chip	1.0 ... 1.2	4.0 ... 4.80	1.8 ... 2.3
1812/4532	single chip	1.2 ... 1.4	5.4 ... 6.30	2.3 ... 3.0
2220/5750	single chip	1.4 ... 1.6	6.8 ... 7.80	3.5 ... 4.8

Termination



KKE0484-W

**Z5U
(Y5U)**

Multilayer ceramic capacitors

Z5U (Y5U)

Product range chip capacitors, Z5U (Y5U)

Size ¹⁾ inch mm	0603 1608		0805 2012		1206 3216		1210 3225		1812 4532		2220 5750	
Type	B37932		B37942		B37873		B37951		B37954		B37957	
V_R (VDC)	25	50	25	50	25	50		50		50		50
C_R												
10 nF												
15 nF												
22 nF												
33 nF												
47 nF												
68 nF												
100 nF												
150 nF												
220 nF												
330 nF												
470 nF												
680 nF												
1.0 μ F												
1.5 μ F												
2.2 μ F												
3.3 μ F												
4.7 μ F												

1) $l \times b$ (inch) / $l \times b$ (mm)

Ordering codes and packing for Z5U (Y5U), 25 VDC, nickel barrier terminations

C _R	Ordering code	Chip thickness mm	Cardboard tape, Ø 180-mm reel	Cardboard tape, Ø 330-mm reel	Bulk case
			** \triangleq 60	** \triangleq 70	** \triangleq 01
			pcs/reel	pcs/reel	pcs

Case size 0603, 25 VDC

100 nF	B37932K0104M0**	0.8 ± 0.1	4000	16000	15000
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Case size 0805, 25 VDC

150 nF	B37942K0154M0**	0.8 ± 0.1	4000	16000	–
220 nF	B37942K0224M0**	0.8 ± 0.1	4000	16000	–

Case size 1206, 25 VDC

1.0 µF	B37873K0105M0**	1.2 ± 0.1	3000 ¹⁾	12000 ²⁾	–
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Ordering codes and packing for Z5U (Y5U), 50 VDC, nickel barrier terminations

C _R	Ordering code	Chip thickness mm	Cardboard tape, Ø 180-mm reel	Cardboard tape, Ø 330-mm reel	Bulk case
			** \triangleq 60	** \triangleq 70	** \triangleq 01
			pcs/reel	pcs/reel	pcs

Case size 0603, 50 VDC

10 nF	B37932K5103M0**	0.8 ± 0.1	4000	16000	15000
22 nF	B37932K5223M0**	0.8 ± 0.1	4000	16000	15000
47 nF	B37932K5473M0**	0.8 ± 0.1	4000	16000	15000

Case size 0805, 50 VDC

10 nF	B37942K5103M0**	0.6 ± 0.1	5000	20000	10000
22 nF	B37942K5223M0**	0.6 ± 0.1	5000	20000	10000
47 nF	B37942K5473M0**	0.6 ± 0.1	5000	20000	10000
100 nF	B37942K5104M0**	0.8 ± 0.1	4000	16000	–

Case size 1206, 50 VDC

100 nF	B37873K5104M0**	0.8 ± 0.1	4000	16000	–
220 nF	B37873K5224M0**	0.8 ± 0.1	4000	16000	–
470 nF	B37873K5474M0**	1.2 ± 0.1	3000 ¹⁾	12000 ²⁾	–

Case size 1210, 50 VDC

470 nF	B37951K5474M0**	0.8 ± 0.1	4000 ¹⁾	16000 ²⁾	–
1.0 µF	B37951K5105M0**	1.2 ± 0.1	3000 ¹⁾	12000 ²⁾	–

1) Blister tape, 180-mm reel, ordering code ** \triangleq 62
 2) Blister tape, 330-mm reel, ordering code ** \triangleq 72

Z5U (Y5U)

Multilayer ceramic capacitors
Z5U (Y5U); 1812 and 2220
Ordering codes and packing for Z5U (Y5U), 50 VDC, silver-palladium terminations

C _R	Ordering code	Chip thickness mm	Blister tape, Ø 180-mm reel	Blister tape, Ø 330-mm reel
			** \triangleq 62	** \triangleq 72
			pcs/reel	pcs/reel

Case size 1812, 50 VDC

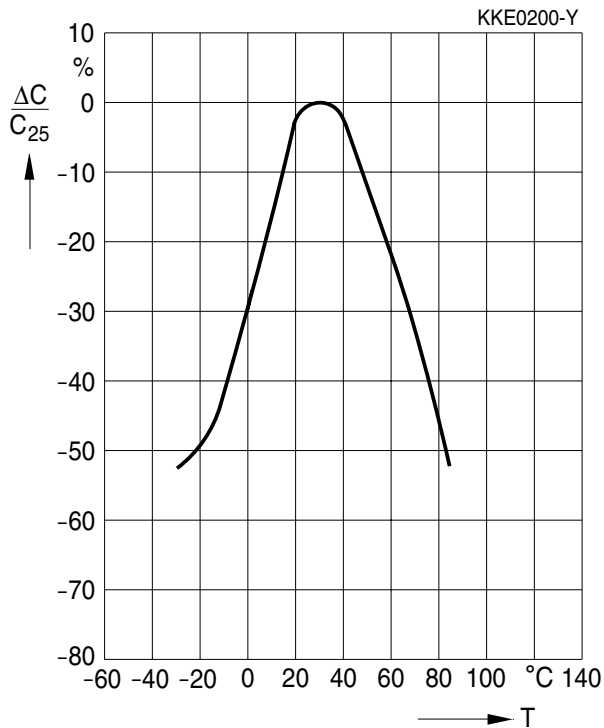
680 nF	B37954J5684M0**	1.2 ±0.1	1500	5000
1.0 µF	B37954J5105M0**	1.2 ±0.1	1500	5000
1.5 µF	B37954J5155M0**	1.2 ±0.1	1500	5000

Case size 2220, 50 VDC

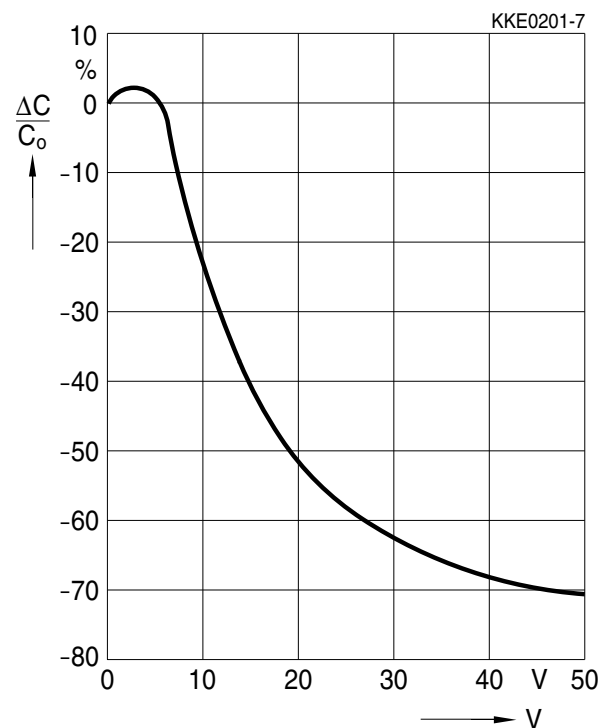
1.0 µF	B37957J5105M0**	1.2 ±0.1	1500	5000
2.2 µF	B37957J5225M0**	1.2 ±0.1	1500	5000
4.7 µF	B37957J5475M0**	1.2 ±0.1	1500	5000

Typical characteristics

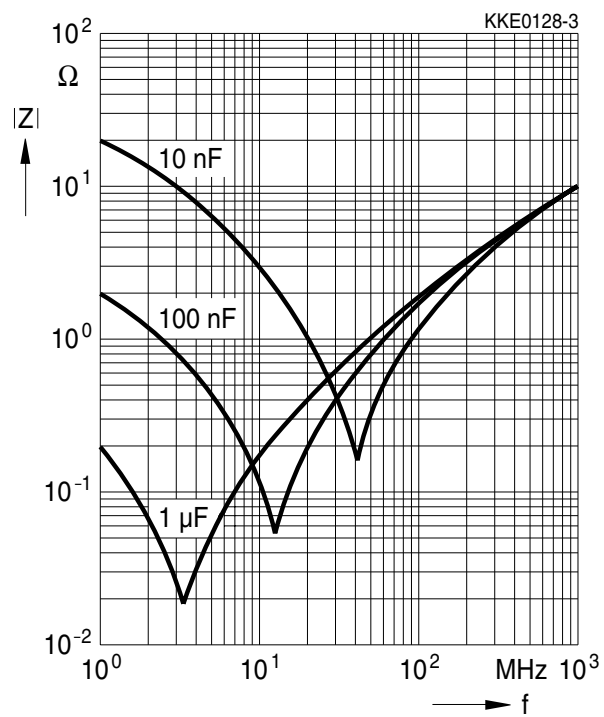
Capacitance change $\Delta C/C_{25}$ versus temperature T



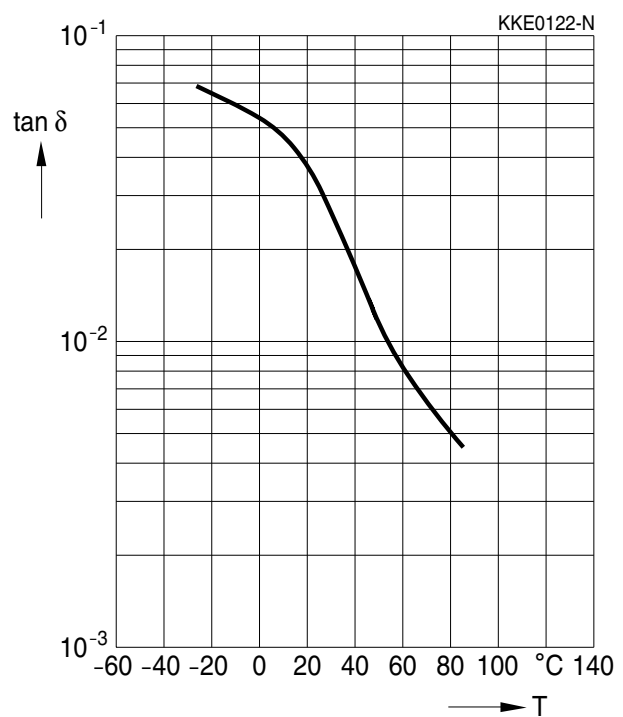
Capacitance change $\Delta C/C_0$ versus superimposed DC voltage V



Impedance |Z| versus frequency f

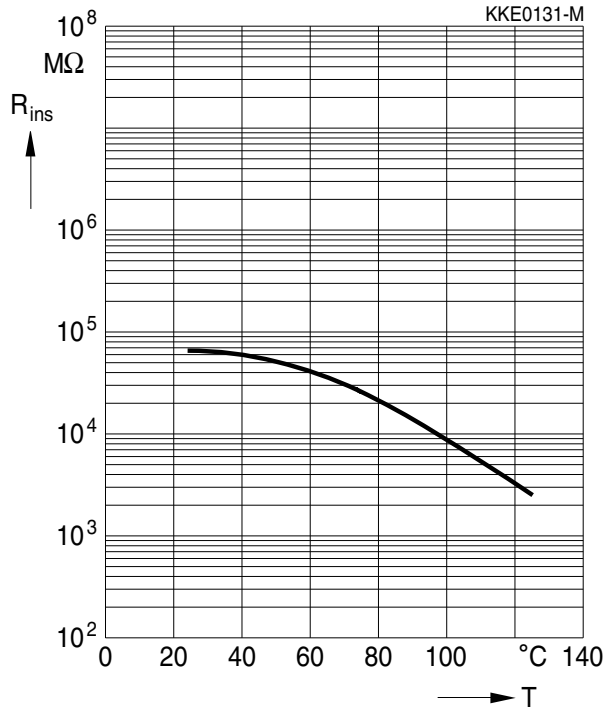


Dissipation factor $\tan \delta$ versus temperature T

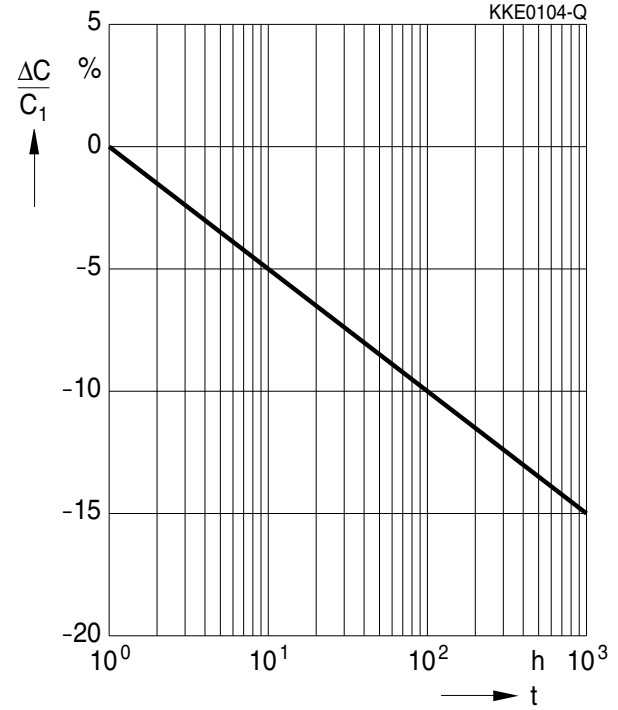


Typical characteristics

Insulation resistance R_{ins} versus temperature T



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



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.

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.
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