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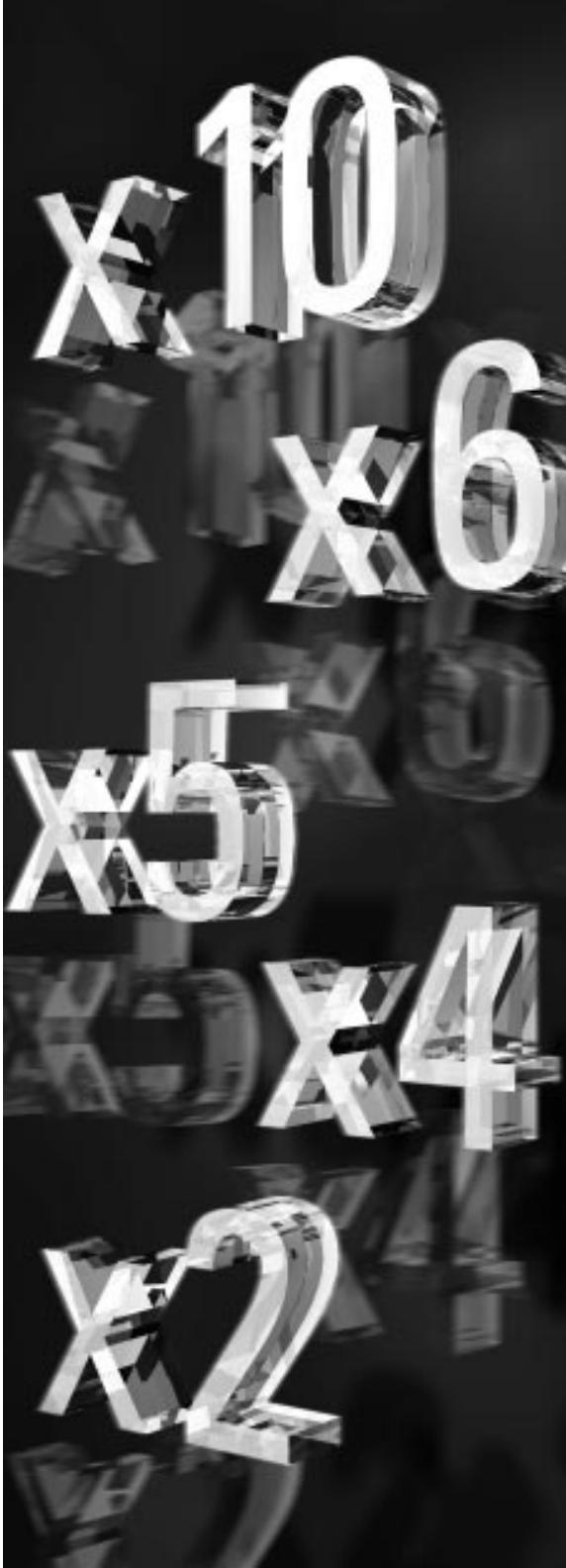

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Ordering code	Rated voltage	Temperature characteristic	Size/ Lead spacing	Page
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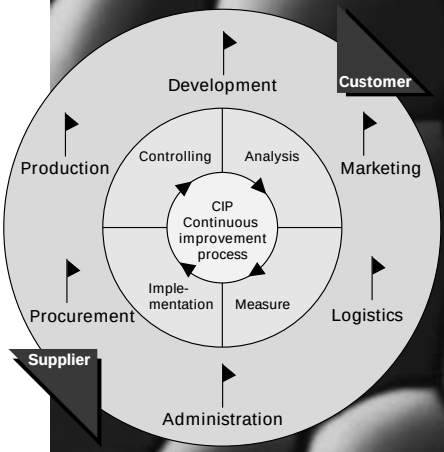


Standard chip capacitors, C0G/CG

Size	0402	0603	0805	1206	1210
l (mm)	1,0 ± 0,1	1,6 ± 0,15	2,0 ± 0,2	3,2 ± 0,2	3,2 ± 0,2
b (mm)	0,5 ± 0,05	0,8 ± 0,1	1,25 ± 0,15	1,6 ± 0,15	2,5 ± 0,2
s (mm)[1]	0,5 ± 0,05	0,8 ± 0,1	1,3 max.	1,3 max.	1,3 max.
Type	B37920	B37930	B37940	B37871	B37949
V_R (Vdc)[2]	25	50	50 / 100	50 / 100	50
C_R	1,0 pF … 100 pF	1,0 pF … 470 pF	1,0 pF … 2,2 nF; 1,0 pF … 1,0 nF	1,0 pF … 5,6 nF; 1,0 pF … 2,2 nF	1,0 nF … 10 nF

Capacitance values in accordance with E 12 series, intermediate values available upon request

1) For exact chip thickness, cf. page 28 onwards.
2) Capacitors with voltage ratings V_R = 50 V are also suitable for 63 V applications.

Standard chip capacitors, 2C1

Size		0603		0805		1206		1210		1812		2220	
l	(mm)	1,6 ± 0,15		2,0 ± 0,2		3,2 ± 0,2		3,2 ± 0,2		4,5 ± 0,2		5,7 ± 0,2	
b	(mm)	0,8 ± 0,1		1,25 ± 0,15		1,6 ± 0,15		2,5 ± 0,2		3,2 ± 0,2		5,0 ± 0,2	
s	(mm)[1]	0,8 ± 0,1		1,3 max.		1,3 max.		1,3 max.		1,3 max.		1,3 max.	
Type		B37731		B37741		B37672		B37750		B37753		B37756	
V_R (Vdc)[2]		25	50	25	50	25	50		50		50		50
C_R		4,7 nF – 22 nF	220 pF – 10 nF	10 nF – 100 nF	470 pF – 47 nF	22 nF – 220 nF	1,0 nF – 100 nF		10 nF – 220 nF		100 nF – 470 nF		470 nF – 1,0 µF

Capacitance values in accordance with E 12 series, intermediate values available upon request

1) For exact chip thickness, cf. page 36 onwards.
2) Capacitors with voltage ratings V_R = 50 V are also suitable for 63 V applications.

Standard chip capacitors, X7R/2R1

Size		0402			0603			0805			1206		
l	(mm)	1,0 ± 0,1			1,6 ± 0,15			2,0 ± 0,2			3,2 ± 0,2		
b	(mm)	0,5 ± 0,05			0,8 ± 0,1			1,25 ± 0,15			1,6 ± 0,15		
s	(mm)[1]	0,5 ± 0,05			0,8 ± 0,1			1,3 max.			1,3 max.		
Type		B37921			B37931			B37941			B37872		
V_R (Vdc)[2]			25		25	50		25	50	100	25	50	100
C_R			470 pF – 2,2 nF		4,7 nF – 22 nF	220 pF – 10 nF		10 nF – 100 nF	470 pF – 100 nF	470 pF – 15 nF	22 nF – 220 nF	1,0 nF – 100 nF	1,0 nF – 68 nF

Capacitance values in accordance with E 12 series, intermediate values available upon request

1) For exact chip thickness, cf. page 42 onwards.
2) Capacitors with voltage ratings V_R = 50 V are also suitable for 63 V applications (except: 0805, C_R > 47 nF).

Standard chip capacitors, X7R/2R1

Size		1210			1812			2220					
l	(mm)	3,2 ± 0,2			4,5 ± 0,2			5,7 ± 0,2					
b	(mm)	2,5 ± 0,2			3,2 ± 0,2			5,0 ± 0,2					
s	(mm)[1)]	1,3 max.			1,3 max.			1,3 max.					
Type		B37950			B37953			B37956					
V_R (Vdc)[2)]			50	100		50			50				
C_R			10 nF – 220 nF	10 nF – 150 nF		100 nF – 470 nF			470 nF – 1,0 µF				

Capacitance values in accordance with E 12 series, intermediate values available upon request

1) For exact chip thickness, cf. page 44 onwards.
2) Capacitors with voltage ratings V_R = 50 V are also suitable for 63 V applications.

Standard chip capacitors, Z5U (Y5U)/2F4

Size	0402		0603		0805		1206		1210		1812		2220	
l (mm)	1,0 ± 0,1		1,6 ± 0,15		2,0 ± 0,2		3,2 ± 0,2		3,2 ± 0,2		4,5 ± 0,2		5,7 ± 0,2	
b (mm)	0,5 ± 0,05		0,8 ± 0,1		1,25 ± 0,15		1,6 ± 0,15		2,5 ± 0,2		3,2 ± 0,2		5,0 ± 0,2	
s (mm)[1]	0,5 ± 0,05		0,8 ± 0,1		1,3 max.		1,3 max.		1,3 max.		1,3 max.		1,3 max.	
Type	B37922		B37932		B37942		B37873		B37951		B37954		B37957	
V_R (Vdc)[2]	25		25	50	25	50	25	50		50		50		50
C_R	2,2 nF – 10 nF		22 nF – 100 nF	10 nF – 47 nF	47 nF – 330 nF	10 nF – 150 nF	150 nF – 1,0 µF	47 nF – 470 nF		220 nF – 1,0 µF		470 nF – 1,5 µF		1,0 µF – 4,7 µF

Capacitance values in accordance with E 6 series, intermediate values available upon request

1) For exact chip thickness, cf. page 50 onwards.
2) Capacitors with voltage ratings V_R = 50 V are also suitable for 63 V applications.

Slim-line chip capacitors

Ceramic material	C0G/CG						X7R/2R1					
Size	0805		1206		1210		0805		1206		1210	
l (mm)	2,0 ± 0,2		3,2 ± 0,2		3,2 ± 0,2		2,0 ± 0,2		3,2 ± 0,2		3,2 ± 0,2	
b (mm)	1,25 ± 0,15		1,6 ± 0,15		2,5 ± 0,2		1,25 ± 0,15		1,6 ± 0,15		2,5 ± 0,2	
s (mm)	0,6 ± 0,1		0,6 ± 0,1		0,6 ± 0,1		0,6 ± 0,1		0,6 ± 0,1		0,6 ± 0,1	
Type	B37940		B37871		B37949		B37941		B37872		B37950	
V_R (Vdc)[1]		50		50		50		50		50		50
C_R		1,0 pF 1,0 nF		1,0 pF 2,2 nF		2,7 nF 4,7 nF		470 pF 18 nF		1,0 nF 47 nF		10 nF 100 nF

Capacitance values in accordance with E 12 series, intermediate values available upon request

1) Capacitors with voltage ratings V_R = 50 V are also suitable for 63 V applications.

Slim-line chip capacitors

Ceramic material	Z5U(Y5U)/2F4						
Size	0805		1206		1210		
l (mm)	2,0 ± 0,2		3,2 ± 0,2		3,2 ± 0,2		
b (mm)	1,25 ± 0,15		1,6 ± 0,15		2,5 ± 0,2		
s (mm)	0,6 ± 0,1		0,6 ± 0,1		0,6 ± 0,1		
Type	B37942		B37873		B37951		
V_R (Vdc)[1]	25	50	25	50	25	50	
C_R ↓	47 nF 100 nF	10 nF 68 nF	150 nF 330 nF	47 nF 150 nF		220 nF 330 nF	

Capacitance values in accordance with E 6 series, intermediate values available upon request

1) Capacitors with voltage ratings V_R = 50 V are also suitable for 63 V applications.

Chip capacitors in bulk case packing

Ceramic material	C0G/CG						X7R/2R1					
Size	0603		0805		1206		0603		0805		1206	
l (mm)	1,6 ± 0,15		2,0 ± 0,2		3,2 ± 0,2		1,6 ± 0,15		2,0 ± 0,2		3,2 ± 0,2	
b (mm)	0,8 ± 0,07		1,25 ± 0,1		1,6 ± 0,1		0,8 ± 0,07		1,25 ± 0,1		1,6 ± 0,1	
s (mm)	0,8 ± 0,07		0,6 ± 0,1		0,6 ± 0,1		0,8 ± 0,07		0,6 ± 0,1		0,6 ± 0,1	
Type	B37930		B37940		B37871		B37931		B37941		B37872	
V_R (Vdc)[1]		50		50		50	25	50		50		50
C_R		1,0 pF – 470 pF		1,0 pF – 1,0 nF		1,0 pF – 2,2 nF	4,7 nF – 22 nF	220 pF – 10 nF		470 pF – 18 nF		1,0 nF – 47 nF

Capacitance values in accordance with E 12 series, intermediate values available upon request

1) Capacitors with voltage ratings V_R = 50 V are also suitable for 63 V applications.

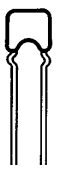
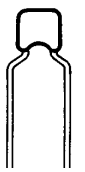
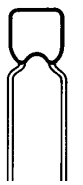
Chip capacitors in bulk case packing

Ceramic material	Z5U(Y5U)/2F4						
Size	0603		0805		1206		
l (mm)	1,6 ± 0,15		2,0 ± 0,2		3,2 ± 0,2		
b (mm)	0,8 ± 0,07		1,25 ± 0,1		1,6 ± 0,1		
s (mm)	0,8 ± 0,07		0,6 ± 0,1		0,6 ± 0,1		
Type	B37932		B37942		B37873		
V_R (Vdc)[1]	25	50		50		50	
C_R ↓	22 nF – 100 nF	10 nF – 47 nF		10 nF – 68 nF		47 nF – 150 nF	

Capacitance values in accordance with E6 series, intermediate values available upon request

1) Capacitors with voltage ratings V_R = 50 V are also suitable for 63 V applications.

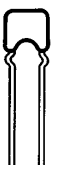
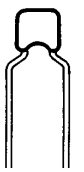
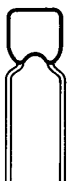
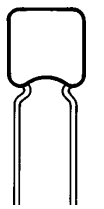
Multilayer capacitors with radial crimped leads, EIA standard, C0G

Lead spacing	2,5 mm				5,0 mm				
									
l (mm)	5,5		6,5		5,5		6,5		
b (mm)	5,0		5,0		5,0		5,0		
s (mm)	2,5		2,5		2,5		2,5		
Type	B37979-N		B37986-N		B37979-G		B37986-G		
V_R (Vdc)[1]	50	100	50	100	50	100	50	100	
C_R	100 pF – 2,2 nF	10 pF – 1,0 nF	2,7 nF – 10 nF	1,2 nF – 2,2 nF	100 pF – 2,2 nF	10 pF – 1,0 nF	2,7 nF – 10 nF	1,2 nF – 2,2 nF	

Capacitance values in accordance with E 12 series, intermediate values available upon request

1) Capacitors with voltage ratings V_R = 50 V are also suitable for 63 V applications.

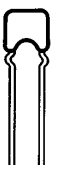
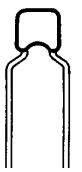
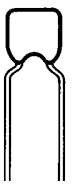
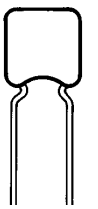
Multilayer capacitors with radial crimped leads, EIA standard, X7R

Lead spacing	2,5 mm				5,0 mm						
											
l (mm)	5,5		6,5		5,5		6,5		9,0		
b (mm)	5,0		5,0		5,0		5,0		7,5		
s (mm)	2,5		2,5		2,5		2,5		2,5		
Type	B37981-M		B37987-M		B37981-F		B37987-F		B37984-M		
V_R (Vdc)[1)]	50	100	50	100	50	100	50	100	50		
C_R	3,3 nF – 47 nF	470 pF – 15 nF	56 nF – 220 nF	18 nF – 150 nF	3,3 nF – 47 nF	470 pF – 15 nF	56 nF – 220 nF	18 nF – 150 nF	270 nF – 1,0 µF		

Capacitance values in accordance with E 12 series, intermediate values available upon request

1) Capacitors with voltage ratings V_R = 50 V are also suitable for 63 V applications.

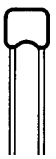
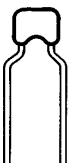
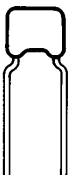
Multilayer capacitors with radial crimped leads, EIA standard, Z5U(Y5U)

Lead spacing	2,5 mm		5,0 mm			
						
l (mm)	5,5	6,5	5,5	6,5	9,0	
b (mm)	5,0	5,0	5,0	5,0	7,5	
s (mm)	2,5	2,5	2,5	2,5	2,5	
Type	B37982-N	B37988-N	B37982-G	B37988-G	B37985-N	
V_R (Vdc)[1)]	50	50	50	50	50	
C_R ↓	**10 nF** – **150 nF**	**220 nF** – **1,0 µF**	**10 nF** – **150 nF**	**220 nF** – **1,0 µF**	**1,5 µF** – **4,7 µF**	

Capacitance values in accordance with E 6 series, intermediate values available upon request

1) Capacitors with voltage ratings V_R = 50 V are also suitable for 63 V applications.

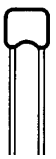
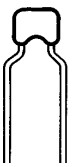
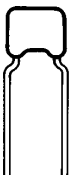
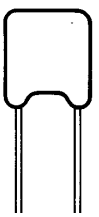
Multilayer capacitors with radial straight leads, CECC standard, CG

Lead spacing	2,5 mm				5,0 mm				
									
l (mm)	5,5		6,5		5,5		6,5		
b (mm)	3,8		5,0		3,8		5,0		
s (mm)	2,5		2,5		2,5		2,5		
Type	B37979-K		B37986-K		B37979-D		B37986-D		
V_R (Vdc)[1]	50	100	50	100	50	100	50	100	
C_R	100 pF – 2,2 nF	10 pF – 1,0 nF	2,7 nF – 10 nF	1,2 nF – 2,2 nF	100 pF – 2,2 nF	10 pF – 1,0 nF	2,7 nF – 10 nF	1,2 nF – 2,2 nF	

Capacitance values in accordance with E 12 series, intermediate values available upon request

1) Capacitors with voltage ratings V_R = 50 V are also suitable for 63 V applications.

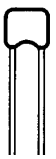
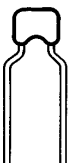
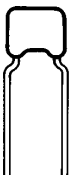
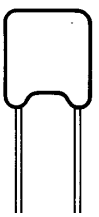
Multilayer capacitors with radial straight leads, CECC standard, 2C1

Lead spacing	2,5 mm		5,0 mm			
						
l (mm)	5,5	6,5	5,5	6,5	9,0	
b (mm)	3,8	5,0	3,8	5,0	7,5	
s (mm)	2,5	2,5	2,5	2,5	2,5	
Type	B37981-K	B37987-K	B37981-D	B37987-D	B37984-K	
V_R (Vdc)[1)]	50	50	50	50	50	
C_R ↓	3,3 nF – 47 nF	56 nF – 220 nF	3,3 nF – 47 nF	56 nF – 220 nF	270 nF – 1,0 µF	

Capacitance values in accordance with E 12 series, intermediate values available upon request

1) Capacitors with voltage ratings V_R = 50 V are also suitable for 63 V applications.

Multilayer capacitors with radial straight leads, CECC standard, 2F4

Lead spacing	2,5 mm		5,0 mm			
						
l (mm) *b* (mm) *s* (mm)	5,5 3,8 2,5	6,5 5,0 2,5	5,5 3,8 2,5	6,5 5,0 2,5	9,0 7,5 2,5	
Type	B37982-K	B37988-K	B37982-D	B37988-D	B37985-K	
V_R (Vdc)[1)]	50	50	50	50	50	
C_R ↓	**10 nF** **150 nF**	**220 nF** **1,0 µF**	**10 nF** **150 nF**	**220 nF** **1,0 µF**	**1,5 µF** **4,7 µF**	

Capacitance values in accordance with E 6 series, intermediate values available upon request

1) Capacitors with voltage ratings V_R = 50 V are also suitable for 63 V applications.

Temperature characteristic EIA/CECC standard	C0G/CG EIA/CECC	2C1 CECC	X7R/2R1 EIA/CECC	Z5U (Y5U) [1] EIA	2F4 CECC
Dielectric	Class 1	Class 2	Class 2	Class 2	Class 2
Rated voltage V_R [2]	25/50/100 Vdc	25/50 Vdc	25/50/100 Vdc	25/50 Vdc	25/50/100 Vdc
Climatic category (IEC 68-1)	 55/125/56	 55/125/56	 55/125/56	 30/085/56	 25/085/56
Temperature range	– 55 ... + 125 °C			– 30 ... + 85 °C	– 25 ... + 85 °C
Available capacitance values C_R E series	1 pF – 10 nF E12	220 pF – 1 µF E12	220 pF – 1 µF E12	10 nF – 4,7 µF E6	10 nF – 4,7 µF E6
Capacitance tolerance (standard in bold print)	C_R < 10 pF: ± 0,1 pF ± **0,25 pF** ± 0,5 pF C_R ≥10 pF: ± 1 % ± 2 % ± **5 %** ± 10 %	 ± **10 %** ± 20 %	 ± 5 % ± **10 %** ± 20 %	 ± **20 %**	 ± **20 %**
Temperature coefficient (tolerance)	$0 \pm 30 \cdot 10^{-6}$/K	–	–	–	–
Max. rel. capacitance change $\Delta C/C$ at V_{meas} V_R	 – –	 ± 20 % + 20/– 30 %	 ± 15 % –	 +22/– 56 % –	 + 30/– 80 % + 30/– 90 %
Voltage test	2,5 · V_R/5s				
Dissipation factor tan δ (limit value)	$< 1{,}0 \cdot 10^{-3}$	$< 25 \cdot 10^{-3}$	$< 25 \cdot 10^{-3}$	$< 30 \cdot 10^{-3}$	$< 30 \cdot 10^{-3}$
Insulation resistance[3] at 25 °C 125 °C	 $> 10^5$ MΩ $> 10^4$ MΩ	 $> 10^5$ MΩ $> 10^4$ MΩ	 $> 10^5$ MΩ $> 10^4$ MΩ	 $> 10^4$ MΩ –	 $> 10^4$ MΩ –
Time constant τ [3] at 25 °C 125 °C	 > 1000 s > 100 s	 > 1000 s > 100 s	 > 1000 s > 100 s	 > 500 s –	 > 500 s –

1) Also meets Y5U specification.
2) Capacitors with voltage ratings V_R = 50 V are also suitable for 63 V applications.
3) The lower value always applies.

Features

- Good thermal stability
- High insulation resistance
- Low dissipation factor
- Low inductance

Applications

- Resonant circuits
- Filter circuits
- Timing elements
- Coupling and filtering, particularly in RF circuits

Terminals

- For soldering: silver-nickel-tin
- For conductive adhesion: silver-nickel

Packing

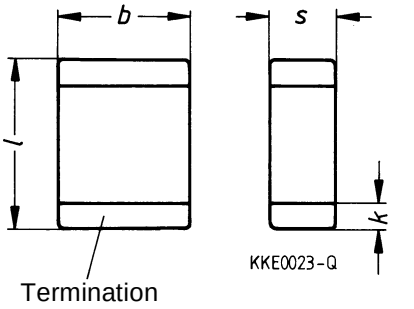
- Taping: blister and cardboard, for details refer to chapter on "Taping and Packing", page 105.
- Bulk case for sizes 0603, 0805 and 1206, for details cf. page 107.

Marking

Upon request

Maximum ratings

Climatic category
in accordance with IEC 68-1: 55/125/56



Dimensions (mm)

Size	*l*	*b*	*s*	*k* [1]
0402	1,0 ± 0,1	0,5 ± 0,05	0,5 ± 0,05	0,2
0603	1,6 ± 0,15	0,8 ± 0,1	0,8 ± 0,1	0,3
0805	2,0 ± 0,2	1,25 ± 0,15	1,3 max.	0,5
1206	3,2 ± 0,2	1,6 ± 0,15	1,3 max.	0,5
1210	3,2 ± 0,2	2,5 ± 0,2	1,3 max.	0,5

For reduced height refer to slim-line capacitors, page 55.

Available capacitance tolerances[2]

Rated capacitance C_R	Tolerance	Symbol
C_R < 10 pF:	ΔC_R = ± 0,1 pF	B
	$\Delta \boldsymbol{C_R}$ = ± **0,25 pF**	**C** [3]
	ΔC_R = ± 0,5 pF	D
$C_R \geq$ 10 pF:	$\Delta C_R/C_R$ = ± 1 %	F
	$\Delta C_R/C_R$ = ± 2 %	G
	$\Delta \boldsymbol{C_R}/\boldsymbol{C_R}$ = ± **5 %**	**J** [3]
	$\Delta C_R/C_R$ = ± 10 %	K

Rated voltage values

V_R = 25 V, 50 V [4], 100 V

1) Tolerances in accordance with CECC 32 101-801.
2) Capacitance values C_R < 1 pF upon request
3) Standard tolerance
4) Also suitable for 63 V applications.

Ordering codes for standard chip capacitors, C0G/CG, 25 Vdc, AgNiSn terminals

Size	0402
C_R	Ordering code [1] B37920-
1,0 pF	-K0010-C60 ▲
1,2 pF	-K0010-C260 ▲
1,5 pF	-K0010-C560 ▲
1,8 pF	-K0010-C860 ▲
2,2 pF	-K0020-C260 ▲
2,7 pF	-K0020-C760 ▲
3,3 pF	-K0030-C360 ▲
3,9 pF	-K0030-C960 ▲
4,7 pF	-K0040-C760 ▲
5,6 pF	-K0050-C660 ▲
6,8 pF	-K0060-C860 ▲
8,2 pF	-K0080-C260 ▲
10 pF	-K0100-J60 ▲
12 pF	-K0120-J60 ▲
15 pF	-K0150-J60 ▲
18 pF	-K0180-J60 ▲
22 pF	-K0220-J60 ▲
27 pF	-K0270-J60 ▲
33 pF	-K0330-J60 ▲
39 pF	-K0390-J60 ▲
47 pF	-K0470-J60 ▲
56 pF	-K0560-J60 ▲
68 pF	-K0680-J60 ▲
82 pF	-K0820-J60 ▲
100 pF	-K0101-J60 ▲

Chip thickness: ▲: 0,5 ± 0,05 mm

1) The tables contain the ordering code for chip capacitors, V_R = 25 Vdc
– with a capacitance tolerance of ± 5 % (for C_R < 10 pF: ΔC_R = ± 0,25 pF)
– on cardboard tape on a 180 mm diameter reel.
For other versions refer to “Delivery Modes and Ordering Code”, page 113.

Ordering codes for standard chip capacitors, C0G/CG, 50 Vdc, AgNiSn terminals

Size	0603	0805	1206	1210	
C_R	Ordering code [1]				
	B37930-	B37940-	B37871-	B37949-	
1,0 pF	-K5010-C60 ❍	-K5010-C60 ❑	-K5010-C62 ❍		
1,2 pF	-K5010-C260 ❍	-K5010-C260 ❑	-K5010-C262 ❍		
1,5 pF	-K5010-C560 ❍	-K5010-C560 ❑	-K5010-C562 ❍		
1,8 pF	-K5010-C860 ❍	-K5010-C860 ❑	-K5010-C862 ❍		
2,2 pF	-K5020-C260 ❍	-K5020-C260 ❑	-K5020-C262 ❍		
2,7 pF	-K5020-C760 ❍	-K5020-C760 ❑	-K5020-C762 ❍		
3,3 pF	-K5030-C360 ❍	-K5030-C360 ❑	-K5030-C362 ❍		
3,9 pF	-K5030-C960 ❍	-K5030-C960 ❑	-K5030-C962 ❍		
4,7 pF	-K5040-C760 ❍	-K5040-C760 ❑	-K5040-C762 ❍		
5,6 pF	-K5050-C660 ❍	-K5050-C660 ❑	-K5050-C662 ❍		
6,8 pF	-K5060-C860 ❍	-K5060-C860 ❑	-K5060-C862 ❍		
8,2 pF	-K5080-C260 ❍	-K5080-C260 ❑	-K5080-C262 ❍		
10 pF	-K5100-J60 ❍	-K5100-J60 ❑	-K5100-J62 ❍		
12 pF	-K5120-J60 ❍	-K5120-J60 ❑	-K5120-J62 ❍		
15 pF	-K5150-J60 ❍	-K5150-J60 ❑	-K5150-J62 ❍		
18 pF	-K5180-J60 ❍	-K5180-J60 ❑	-K5180-J62 ❍		
22 pF	-K5220-J60 ❍	-K5220-J60 ❑	-K5220-J62 ❍		
27 pF	-K5270-J60 ❍	-K5270-J60 ❑	-K5270-J62 ❍		
33 pF	-K5330-J60 ❍	-K5330-J60 ❑	-K5330-J62 ❍		
39 pF	-K5390-J60 ❍	-K5390-J60 ❑	-K5390-J62 ❍		
47 pF	-K5470-J60 ❍	-K5470-J60 ❑	-K5470-J62 ❍		
56 pF	-K5560-J60 ❍	-K5560-J60 ❑	-K5560-J62 ❍		
68 pF	-K5680-J60 ❍	-K5680-J60 ❑	-K5680-J62 ❍		
82 pF	-K5820-J60 ❍	-K5820-J60 ❑	-K5820-J62 ❍		
100 pF	-K5101-J60 ❍	-K5101-J60 ❑	-K5101-J62 ❍		
120 pF	-K5121-J60 ❍	-K5121-J60 ❑	-K5121-J62 ❍		
150 pF	-K5151-J60 ❍	-K5151-J60 ❑	-K5151-J62 ❍		
180 pF	-K5181-J60 ❍	-K5181-J60 ❑	-K5181-J62 ❍		
220 pF	-K5221-J60 ❍	-K5221-J60 ❑	-K5221-J62 ❍		
270 pF	-K5271-J60 ❍	-K5271-J60 ❑	-K5271-J62 ❍		
330 pF	-K5331-J60 ❍	-K5331-J60 ❑	-K5331-J62 ❍		
390 pF	-K5391-J60 ❍	-K5391-J60 ❑	-K5391-J62 ❍		
470 pF	-K5471-J60 ❍	-K5471-J60 ❑	-K5471-J62 ❍		
560 pF		-K5561-J60 ❑	-K5561-J62 ❍		
680 pF		-K5681-J60 ❑	-K5681-J62 ❍		
820 pF		-K5821-J60 ❑	-K5821-J62 ❍		

continued on next page...

Chip thickness: ❑:0,6 ± 0,1 mm
❍:0,8 ± 0,1 mm
◆:1,2 ± 0,1 mm

Ordering codes for standard chip capacitors, C0G/CG, 50 Vdc, AgNiSn terminals

Size	0603	0805	1206	1210	
C_R	Ordering code [1]				
	B37930-	B37940-	B37871-	B37949-	
1,0 nF		-K5102-J60 ❑	-K5102-J62 ❍	-K5102-J62 ❍	
1,2 nF		-K5122-J60 ❍	-K5122-J62 ❍	-K5122-J62 ❍	
1,5 nF		-K5152-J60 ❍	-K5152-J62 ❍	-K5152-J62 ❍	
1,8 nF		-K5182-J62 ◆	-K5182-J62 ❍	-K5182-J62 ❍	
2,2 nF		-K5222-J62 ◆	-K5222-J62 ❍	-K5222-J62 ❍	
2,7 nF			-K5272-J62 ❍	-K5272-J62 ❍	
3,3 nF			-K5332-J62 ❍	-K5332-J62 ❍	
3,9 nF			-K5392-J62 ❍	-K5392-J62 ❍	
4,7 nF			-K5472-J62 ◆	-K5472-J62 ❍	
5,6 nF			-K5562-J62 ◆	-K5562-J62 ❍	
6,8 nF				-K5682-J62 ❍	
8,2 nF				-K5822-J62 ◆	
10 nF				-K5103-J62 ◆	

Chip thickness: ❑:0,6 ± 0,1 mm
❍:0,8 ± 0,1 mm
◆:1,2 ± 0,1 mm

1) The tables contain the ordering code for chip capacitors, V_R = 50 Vdc
– with a capacitance tolerance of ± 5 % (für C_R < 10 pF: ΔC_R = ± 0,25 pF)
– in the respective standard packing:
blister tape (last two digits of ordering code: 62) or cardboard tape (last two digits of ordering code: 60) on 180 mm diameter reels. For other versions refer to “Delivery Modes and Ordering Code”, page 113.

Ordering codes for standard chip capacitors, C0G/CG, 100 Vdc, AgNiSn terminals

Size	0805	1206
C_R	Ordering code [1] B37940-	B37871-
1,0 pF	-K1010-C60 ❑	-K1010-C62 ❍
1,2 pF	-K1010-C260 ❑	-K1010-C262 ❍
1,5 pF	-K1010-C560 ❑	-K1010-C562 ❍
1,8 pF	-K1010-C860 ❑	-K1010-C862 ❍
2,2 pF	-K1020-C260 ❑	-K1020-C262 ❍
2,7 pF	-K1020-C760 ❑	-K1020-C762 ❍
3,3 pF	-K1030-C360 ❑	-K1030-C362 ❍
3,9 pF	-K1030-C960 ❑	-K1030-C962 ❍
4,7 pF	-K1040-C760 ❑	-K1040-C762 ❍
5,6 pF	-K1050-C660 ❑	-K1050-C662 ❍
6,8 pF	-K1060-C860 ❑	-K1060-C862 ❍
8,2 pF	-K1080-C260 ❑	-K1080-C262 ❍
10 pF	-K1100-J60 ❑	-K1100-J62 ❍
12 pF	-K1120-J60 ❑	-K1120-J62 ❍
15 pF	-K1150-J60 ❑	-K1150-J62 ❍
18 pF	-K1180-J60 ❑	-K1180-J62 ❍
22 pF	-K1220-J60 ❑	-K1220-J62 ❍
27 pF	-K1270-J60 ❑	-K1270-J62 ❍
33 pF	-K1330-J60 ❑	-K1330-J62 ❍
39 pF	-K1390-J60 ❑	-K1390-J62 ❍
47 pF	-K1470-J60 ❑	-K1470-J62 ❍
56 pF	-K1560-J60 ❑	-K1560-J62 ❍
68 pF	-K1680-J60 ❑	-K1680-J62 ❍
82 pF	-K1820-J60 ❑	-K1820-J62 ❍
100 pF	-K1101-J60 ❑	-K1101-J62 ❍

Size	0805	1206
C_R	Ordering code [1] B37940-	B37871-
120 pF	-K1121-J60 ❑	-K1121-J62 ❍
150 pF	-K1151-J60 ❑	-K1151-J62 ❍
180 pF	-K1181-J60 ❑	-K1181-J62 ❍
220 pF	-K1221-J60 ❑	-K1221-J62 ❍
270 pF	-K1271-J60 ❍	-K1271-J62 ❍
330 pF	-K1331-J60 ❍	-K1331-J62 ❍
390 pF	-K1391-J60 ❍	-K1391-J62 ❍
470 pF	-K1471-J60 ❍	-K1471-J62 ❍
560 pF	-K1561-J60 ❍	-K1561-J62 ❍
680 pF	-K1681-J60 ❍	-K1681-J62 ❍
820 pF	-K1821-J62 ◆	-K1821-J62 ❍
1,0 nF	-K1102-J62 ◆	-K1102-J62 ❍
1,2 nF		-K1122-J62 ❍
1,5 nF		-K1152-J62 ❍
1,8 nF		-K1182-J62 ❍
2,2 nF		-K1222-J62 ◆

Chip thickness: ❑:0,6 ± 0,1 mm
❍:0,8 ± 0,1 mm
◆:1,2 ± 0,1 mm

1) The tables contain the ordering code for chip capacitors, V_R = 50 Vdc
– with a cap. tolerance of ± 5 % (für C_R < 10 pF: ΔC_R = ± 0,25 pF)
– in the respective standard packing:
blister tape (last two digits of ordering code: 62) or cardboard tape (last two digits of ordering code: 60) on 180 mm diameter reels. For other versions refer to “Delivery Modes and Ordering Code”, page 113.

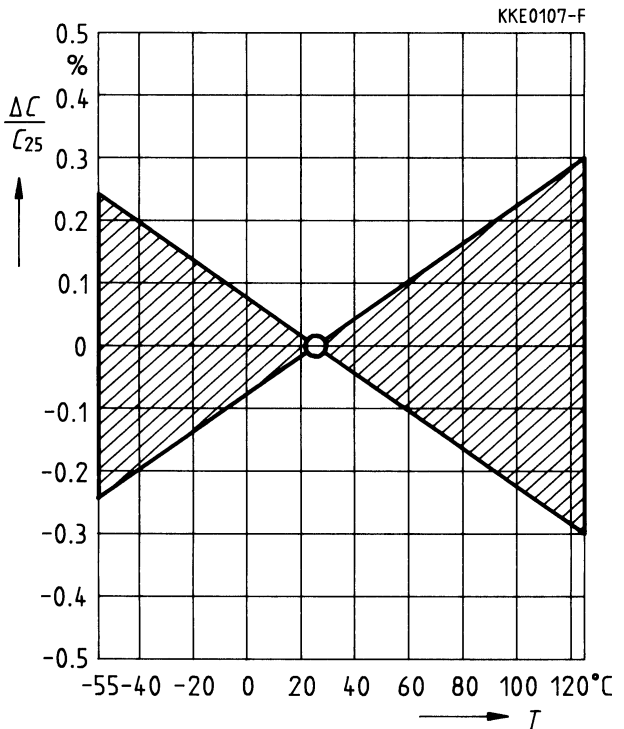
Ordering codes for chip capacitors, C0G/CG, 50 Vdc, AgNiSn terminals, bulk case packing

Size	0603	0805	1206	
C_R	Ordering code [1]			
	B37930-	B37940-	B37871-	
1,0 pF	-K5010-C01	-K5010-C01	-K5010-C01	
1,2 pF	-K5010-C201	-K5010-C201	-K5010-C201	
1,5 pF	-K5010-C501	-K5010-C501	-K5010-C501	
1,8 pF	-K5010-C801	-K5010-C801	-K5010-C801	
2,2 pF	-K5020-C201	-K5020-C201	-K5020-C201	
2,7 pF	-K5020-C701	-K5020-C701	-K5020-C701	
3,3 pF	-K5030-C301	-K5030-C301	-K5030-C301	
3,9 pF	-K5030-C901	-K5030-C901	-K5030-C901	
4,7 pF	-K5040-C701	-K5040-C701	-K5040-C701	
5,6 pF	-K5050-C601	-K5050-C601	-K5050-C601	
6,8 pF	-K5060-C801	-K5060-C801	-K5060-C801	
8,2 pF	-K5080-C201	-K5080-C201	-K5080-C201	
10 pF	-K5100-J01	-K5100-J01	-K5100-J01	
12 pF	-K5120-J01	-K5120-J01	-K5120-J01	
15 pF	-K5150-J01	-K5150-J01	-K5150-J01	
18 pF	-K5180-J01	-K5180-J01	-K5180-J01	
22 pF	-K5220-J01	-K5220-J01	-K5220-J01	
27 pF	-K5270-J01	-K5270-J01	-K5270-J01	
33 pF	-K5330-J01	-K5330-J01	-K5330-J01	
39 pF	-K5390-J01	-K5390-J01	-K5390-J01	
47 pF	-K5470-J01	-K5470-J01	-K5470-J01	
56 pF	-K5560-J01	-K5560-J01	-K5560-J01	
68 pF	-K5680-J01	-K5680-J01	-K5680-J01	
82 pF	-K5820-J01	-K5820-J01	-K5820-J01	
100 pF	-K5101-J01	-K5101-J01	-K5101-J01	
120 pF	-K5121-J01	-K5121-J01	-K5121-J01	
150 pF	-K5151-J01	-K5151-J01	-K5151-J01	
180 pF	-K5181-J01	-K5181-J01	-K5181-J01	
220 pF	-K5221-J01	-K5221-J01	-K5221-J01	
270 pF	-K5271-J01	-K5271-J01	-K5271-J01	
330 pF	-K5331-J01	-K5331-J01	-K5331-J01	
390 pF	-K5391-J01	-K5391-J01	-K5391-J01	
470 pF	-K5471-J01	-K5471-J01	-K5471-J01	
560 pF		-K5561-J01	-K5561-J01	
680 pF		-K5681-J01	-K5681-J01	
820 pF		-K5821-J01	-K5821-J01	
1,0 nF		-K5102-J01	-K5102-J01	
1,2 nF			-K5122-J01	
1,5 nF			-K5152-J01	
1,8 nF			-K5182-J01	
2,2 nF			-K5222-J01	

1) Ordering code for capacitance tolerance ± 5 % (for C_R < 10 pF: ΔC_R = ± 0,25 pF), for other ordering codes refer to page 113

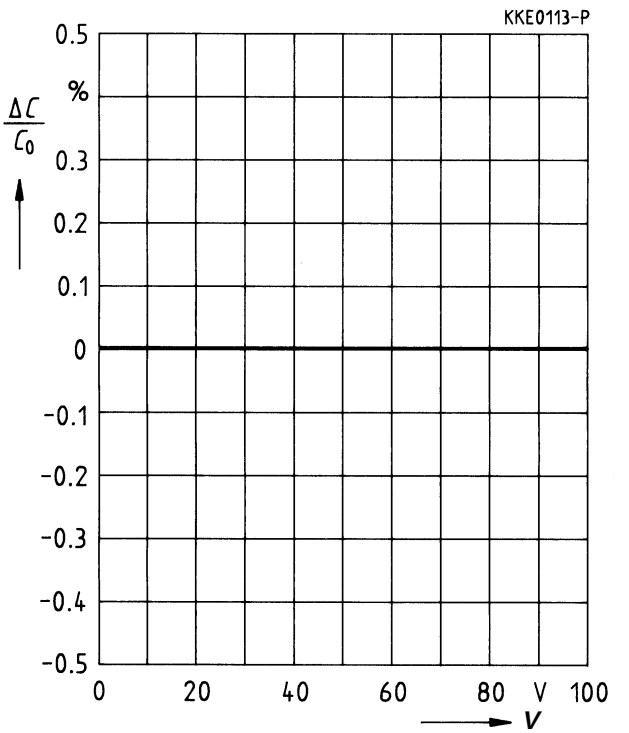
Characteristics

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

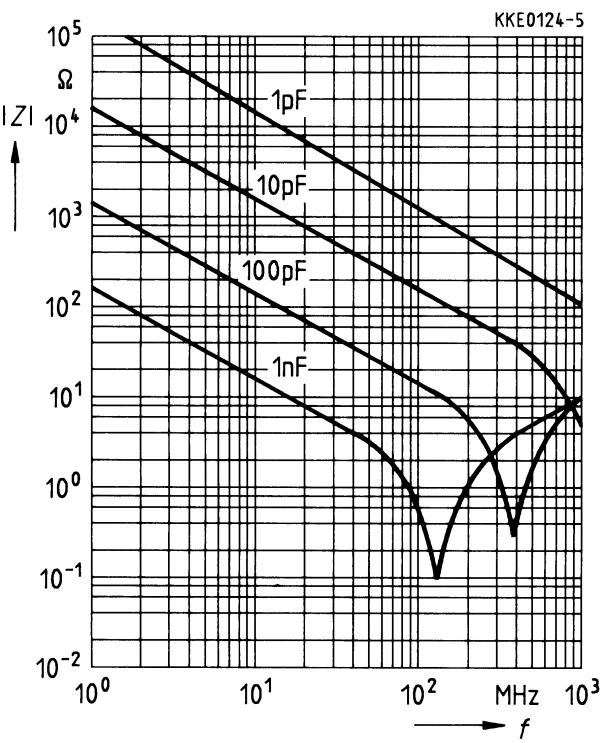


Tolerance range

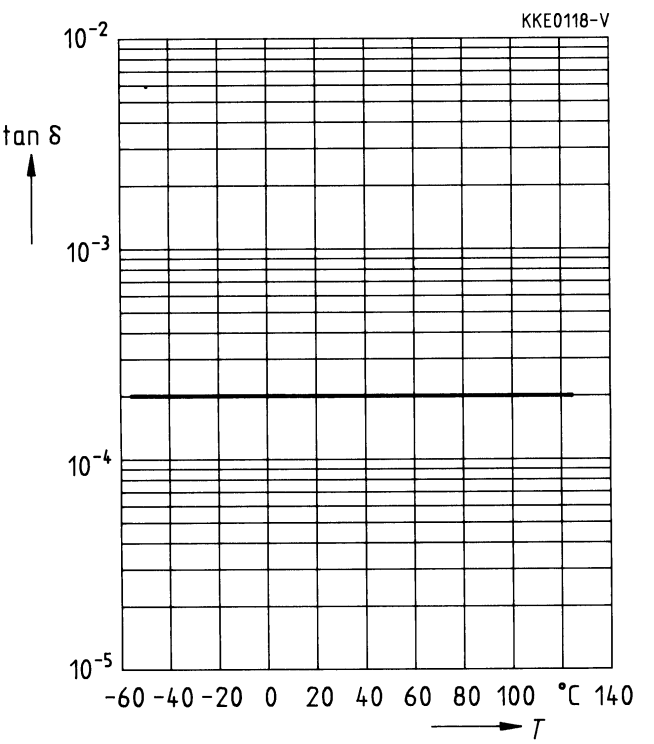
Capacitance change $\Delta C/C_0$ versus superimposed dc voltage V



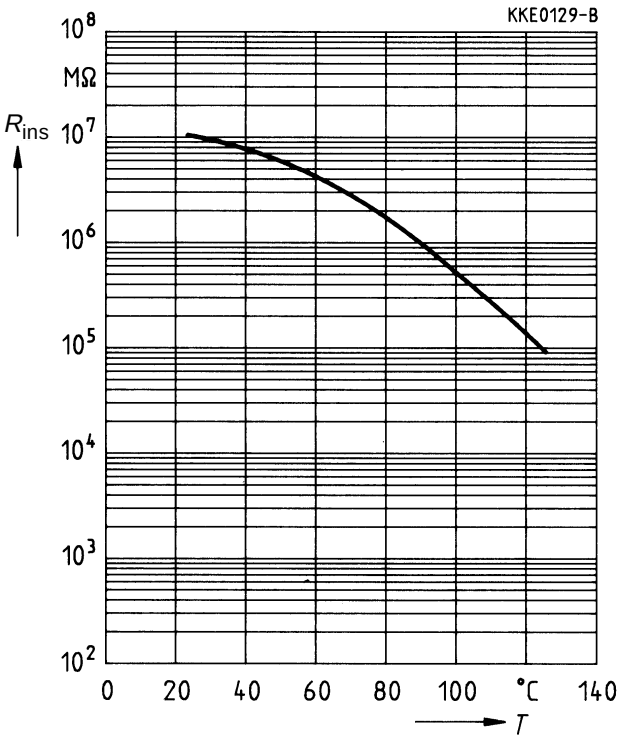
Impedance $|Z|$ versus frequency f



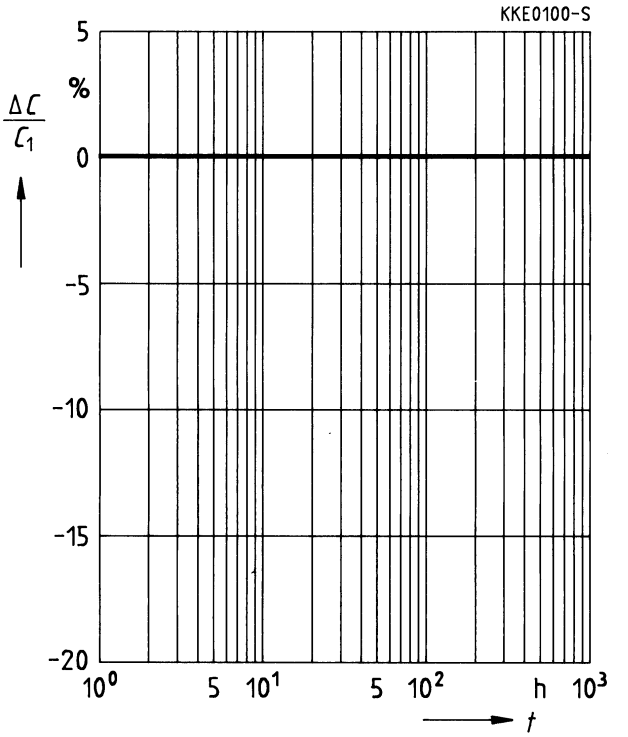
Dissipation factor tan δ versus temperature T



Insulation resistance R_{ins} versus temperature T



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



SMD

Features

- High volumetric efficiency
- Non-linear capacitance change
- High insulation resistance
- High pulse strength

Applications

- Blocking
- Coupling
- Decoupling
- Interference suppression

Terminals

- For soldering:
  silver-nickel-tin
- For conductive adhesion:
  silver-nickel

Packing

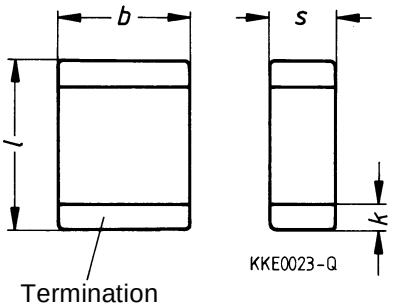
- Taping: blister and cardboard,
  for details refer to chapter
  “Taping and Packing”, page 105.
- Bulk case for sizes 0603, 0805
  and 1206, for details cf. page 107.

Marking

Upon request

Maximum ratings

Climatic category
in accordance with IEC 68-1: 55/125/56



Dimensions (mm)

Size	*l*	*b*	*s*	*k* [1]
0603	1,6 ± 0,15	0,8 ± 0,1	0,8 ± 0,1	0,3
0805	2,0 ± 0,2	1,25 ± 0,15	1,3 max.	0,5
1206	3,2 ± 0,2	1,6 ± 0,15	1,3 max.	0,5
1210	3,2 ± 0,2	2,5 ± 0,2	1,3 max.	0,5
1812	4,5 ± 0,2	3,2 ± 0,2	1,3 max.	0,5
2220	5,7 ± 0,2	5,0 ± 0,2	1,3 max.	0,5

Available capacitance tolerances

Tolerance	Symbol
$\Delta C_R/C_R = \pm$ **10 %**	**K** [2]
$\Delta C_R/C_R = \pm$ 20 %	M

Rated voltage values

V_R = 25 V, 50 V [3]

1) Tolerances in accordance with CECC 32 101-801.
2) Standard tolerance
3) Also suitable for 63 V applications.

Ordering codes for standard chip capacitors, 2C1, 25 Vdc, AgNiSn terminals

Size	0603	0805	1206	
C_R	Ordering code [1]			
	B37731-	B37741-	B37672-	
4,7 nF	-K0472-K60 ❍			
5,6 nF	-K0562-K60 ❍			
6,8 nF	-K0682-K60 ❍			
8,2 nF	-K0822-K60 ❍			
10 nF	-K0103-K60 ❍	-K0103-K60 ❑		
12 nF	-K0123-K60 ❍	-K0123-K60 ❑		
15 nF	-K0153-K60 ❍	-K0153-K60 ❑		
18 nF	-K0183-K60 ❍	-K0183-K60 ❑		
22 nF	-K0223-K60 ❍	-K0223-K60 ❍	-K0223-K62 ❍	
27 nF		-K0273-K60 ❍	-K0273-K62 ❍	
33 nF		-K0333-K60 ❍	-K0333-K62 ❍	
39 nF		-K0393-K60 ❍	-K0393-K62 ❍	
47 nF		-K0473-K60 ❍	-K0473-K62 ❍	
56 nF		-K0563-K60 ❍	-K0563-K62 ❍	
68 nF		-K0683-K60 ❍	-K0683-K62 ❍	
82 nF		-K0823-K62 ◆	-K0823-K62 ❍	
100 nF		-K0104-K62 ◆	-K0104-K62 ❍	
120 nF			-K0124-K62 ❍	
150 nF			-K0154-K62 ❍	
180 nF			-K0184-K62 ◆	
220 nF			-K0224-K62 ◆	

Chip thickness ❑:0,6 ± 0,1 mm
❍:0,8 ± 0,1 mm
◆:1,2 ± 0,1 mm

1) The tables contain the ordering code for chip capacitors, V_R = 25 Vdc
– with a capacitance tolerance of ± 10 %
– in the respective standard packing:
blister tape (last two digits of ordering code: 62) or cardboard tape (last two digits of ordering code: 60) on 180 mm diameter reels. For other versions refer to “Delivery Modes and Ordering Code”, page 113.

Ordering codes for standard chip capacitors, 2C1, 50 Vdc, AgNiSn terminals

Size	0603	0805	1206	
C_R	Ordering code [1)]			
	B37731-	B37741-	B37672-	
220 pF	-K5221-K60 ❍			
270 pF	-K5271-K60 ❍			
330 pF	-K5331-K60 ❍			
390 pF	-K5391-K60 ❍			
470 pF	-K5471-K60 ❍	-K5471-K60 ❑		
560 pF	-K5561-K60 ❍	-K5561-K60 ❑		
680 pF	-K5681-K60 ❍	-K5681-K60 ❑		
820 pF	-K5821-K60 ❍	-K5821-K60 ❑		
1,0 nF	-K5102-K60 ❍	-K5102-K60 ❑	-K5102-K62 ❍	
1,2 nF	-K5122-K60 ❍	-K5122-K60 ❑	-K5122-K62 ❍	
1,5 nF	-K5152-K60 ❍	-K5152-K60 ❑	-K5152-K62 ❍	
1,8 nF	-K5182-K60 ❍	-K5182-K60 ❑	-K5182-K62 ❍	
2,2 nF	-K5222-K60 ❍	-K5222-K60 ❑	-K5222-K62 ❍	
2,7 nF	-K5272-K60 ❍	-K5272-K60 ❑	-K5272-K62 ❍	
3,3 nF	-K5332-K60 ❍	-K5332-K60 ❑	-K5332-K62 ❍	
3,9 nF	-K5392-K60 ❍	-K5392-K60 ❑	-K5392-K62 ❍	
4,7 nF	-K5472-K60 ❍	-K5472-K60 ❑	-K5472-K62 ❍	
5,6 nF	-K5562-K60 ❍	-K5562-K60 ❑	-K5562-K62 ❍	
6,8 nF	-K5682-K60 ❍	-K5682-K60 ❑	-K5682-K62 ❍	
8,2 nF	-K5822-K60 ❍	-K5822-K60 ❑	-K5822-K62 ❍	
10 nF	-K5103-K60 ❍	-K5103-K60 ❑	-K5103-K62 ❍	
12 nF		-K5123-K60 ❑	-K5123-K62 ❍	
15 nF		-K5153-K60 ❑	-K5153-K62 ❍	
18 nF		-K5183-K60 ❑	-K5183-K62 ❍	
22 nF		-K5223-K60 ❍	-K5223-K62 ❍	
27 nF		-K5273-K60 ❍	-K5273-K62 ❍	
33 nF		-K5333-K60 ❍	-K5333-K62 ❍	
39 nF		-K5393-K62 ◆	-K5393-K62 ❍	
47 nF		-K5473-K62 ◆	-K5473-K62 ❍	
56 nF			-K5563-K62 ❍	
68 nF			-K5683-K62 ❍	
82 nF			-K5823-K62 ❍	
100 nF			-K5104-K62 ❍	

continued on next page...

Chip thickness: ❑:0,6 ± 0,1 mm
❍:0,8 ± 0,1 mm
◆:1,2 ± 0,1 mm

Ordering codes for standard chip capacitors, 2C1, 50 Vdc, AgNiSn terminals

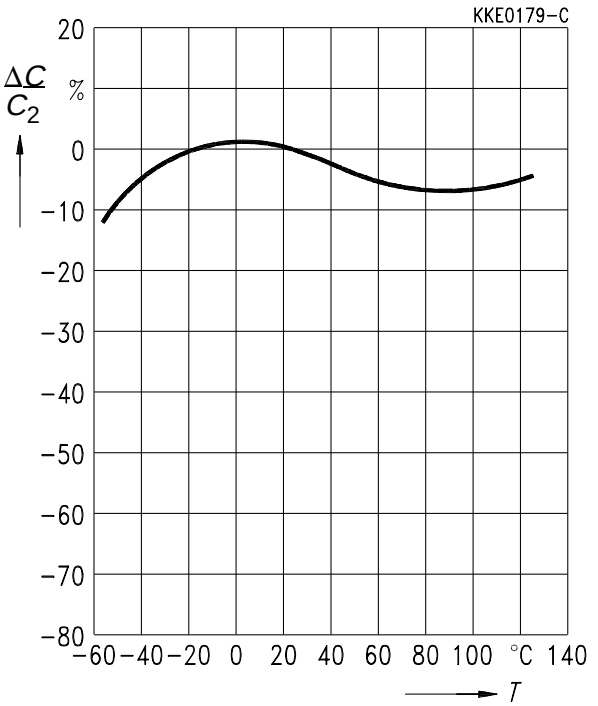
Size	1210	1812	2220	
C_R	Ordering code [1)]			
	B37750-	B37753-	B37756-	
10 nF	-K5103-K62 ❍			
12 nF	-K5123-K62 ❍			
15 nF	-K5153-K62 ❍			
18 nF	-K5183-K62 ❍			
22 nF	-K5223-K62 ❍			
27 nF	-K5273-K62 ❍			
33 nF	-K5333-K62 ❍			
39 nF	-K5393-K62 ❍			
47 nF	-K5473-K62 ❍			
56 nF	-K5563-K62 ❍			
68 nF	-K5683-K62 ❍			
82 nF	-K5823-K62 ❍			
100 nF	-K5104-K62 ❍	-K5104-K62 ◆		
120 nF	-K5124-K62 ❍	-K5124-K62 ◆		
150 nF	-K5154-K62 ❍	-K5154-K62 ◆		
180 nF	-K5184-K62 ◆	-K5184-K62 ◆		
220 nF	-K5224-K62 ◆	-K5224-K62 ◆		
270 nF		-K5274-K62 ◆		
330 nF		-K5334-K62 ◆		
390 nF		-K5394-K62 ◆		
470 nF		-K5474-K62 ◆	-K5474-K62 ◆	
560 nF			-K5564-K62 ◆	
680 nF			-K5684-K62 ◆	
820 nF			-K5824-K62 ◆	
1 µF			-K5105-K62 ◆	

Chip thickness: ❑:0,6 ± 0,1 mm
❍:0,8 ± 0,1 mm
◆:1,2 ± 0,1 mm

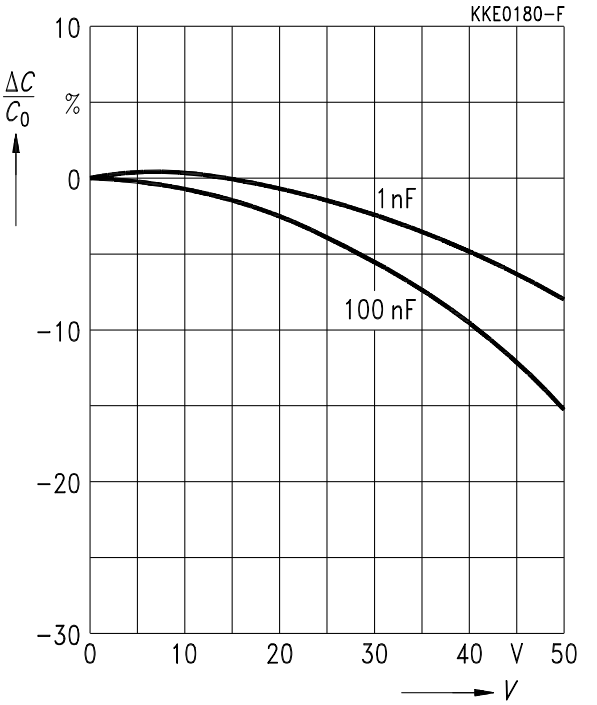
1) The tables contain the ordering code for chip capacitors, V_R = 50 Vdc
– with a capacitance tolerance of ± 10 %
– in the respective standard packing:
blister tape (last two digits of ordering code: 62) or cardboard tape (last two digits of ordering code: 60) on 180 mm diameter reels. For other versions refer to “Delivery Modes and Ordering Code”, page 113.

Characteristics

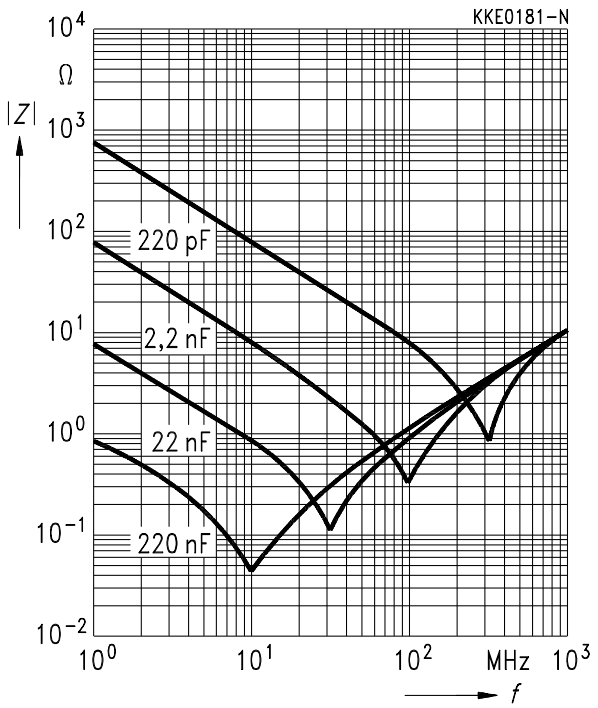
Capacitance change $\Delta C/C_{20}$ versus temperature T



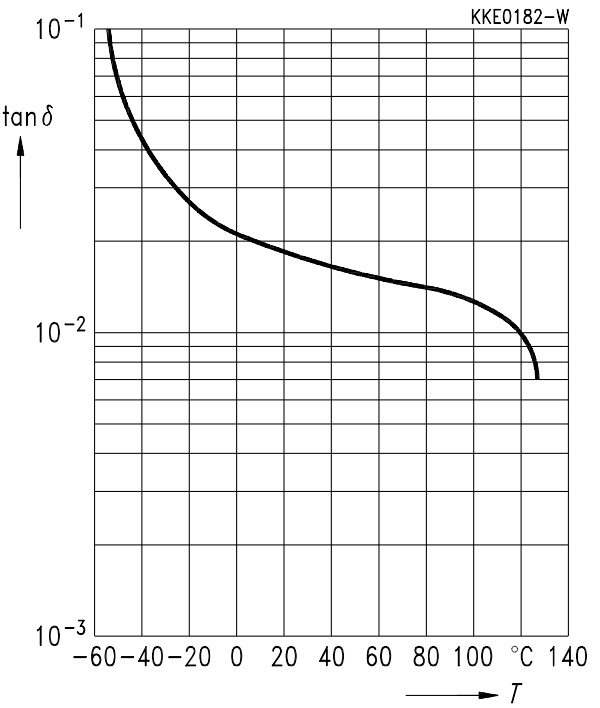
Capacitance change $\Delta C/C_0$ versus superimposed dc voltage V



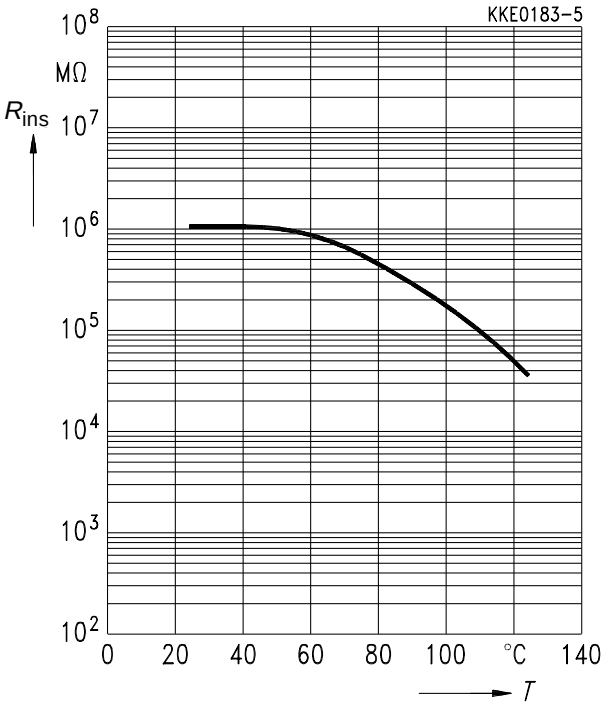
Impedance $|Z|$ versus frequency f



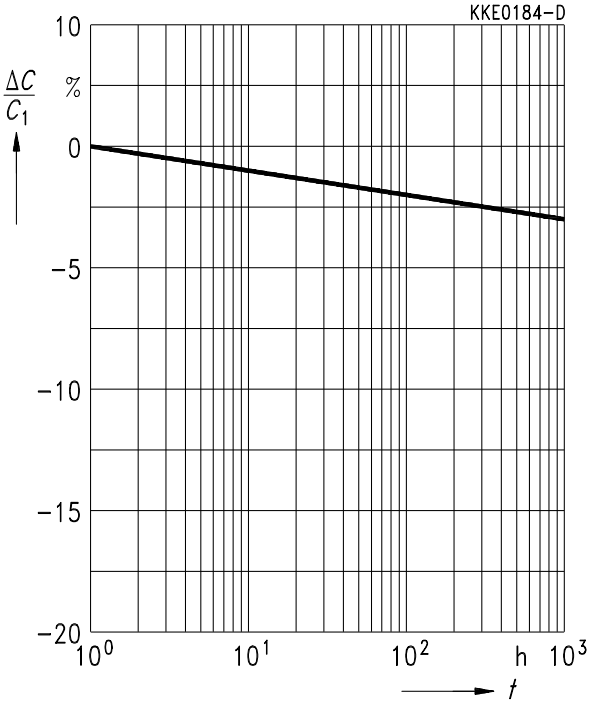
Dissipation factor tan δ versus temperature T



Insulation resistance R_{ins} versus temperature T



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



SMD

Features

- High volumetric efficiency
- Non-linear capacitance change
- High insulation resistance
- High pulse strength

Applications

- Blocking
- Coupling
- Decoupling
- Interference suppression

Terminals

- For soldering:
  silver-nickel-tin
- For conductive adhesion:
  silver-nickel

Packing

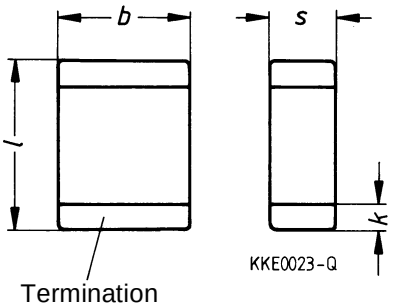
- Taping: blister and cardboard,
  for details refer to chapter
  “Taping and Packing”, page 105.
- Bulk case for sizes 0603, 0805
  and 1206, for details cf. page 107.

Marking

Upon request

Maximum ratings

Climatic category
in accordance with IEC 68-1: 55/125/56



Dimensions (mm)

Size	*l*	*b*	*s*	*k* [1]
0402	1,0 ± 0,1	0,5 ± 0,05	0,5 ± 0,05	0,2
0603	1,6 ± 0,15	0,8 ± 0,1	0,8 ± 0,1	0,3
0805	2,0 ± 0,2	1,25 ± 0,15	1,3 max.	0,5
1206	3,2 ± 0,2	1,6 ± 0,15	1,3 max.	0,5
1210	3,2 ± 0,2	2,5 ± 0,2	1,3 max.	0,5
1812	4,5 ± 0,2	3,2 ± 0,2	1,3 max.	0,5
2220	5,7 ± 0,2	5,0 ± 0,2	1,3 max.	0,5

For reduced height refer to slim-line capacitors, page 55.

Available capacitance tolerances

Tolerance	Symbol
$\Delta C_R/C_R = \pm$ 5 %	J
$\Delta \boldsymbol{C_R/C_R} = \pm$ **10 %**	**K** [2]
$\Delta C_R/C_R = \pm$ 20 %	M

Rated voltage values

V_R = 25 V, 50 V [3],100 V

1) Tolerances in accordance with CECC 32 101-801.
2) Standard tolerance
3) Also suitable for 63 V applications. (except type 0805: C_R > 47 nF).

Ordering codes for standard chip capacitors, X7R/2R1, 25 Vdc, AgNiSn terminals

Size	0402	0603	0805	1206	
C_R	Ordering code [1]				
	B37921-	B37931-	B37941-	B37872-	
470 pF	-K0471-K60 ▲				
560 pF	-K0561-K60 ▲				
680 pF	-K0681-K60 ▲				
820 pF	-K0821-K60 ▲				
1,0 nF	-K0102-K60 ▲				
1,2 nF	-K0122-K60 ▲				
1,5 nF	-K0152-K60 ▲				
1,8 nF	-K0182-K60 ▲				
2,2 nF	-K0222-K60 ▲				
2,7 nF					
3,3 nF					
3,9 nF					
4,7 nF		-K0472-K60 ❍			
5,6 nF		-K0562-K60 ❍			
6,8 nF		-K0682-K60 ❍			
8,2 nF		-K0822-K60 ❍			
10 nF		-K0103-K60 ❍	-K0103-K60 ❑		
12 nF		-K0123-K60 ❍	-K0123-K60 ❑		
15 nF		-K0153-K60 ❍	-K0153-K60 ❑		
18 nF		-K0183-K60 ❍	-K0183-K60 ❑		
22 nF		-K0223-K60 ❍	-K0223-K60 ❍	-K0223-K62 ❍	
27 nF			-K0273-K60 ❍	-K0273-K62 ❍	
33 nF			-K0333-K60 ❍	-K0333-K62 ❍	
39 nF			-K0393-K60 ❍	-K0393-K62 ❍	
47 nF			-K0473-K60 ❍	-K0473-K62 ❍	
56 nF			-K0563-K60 ❍	-K0563-K62 ❍	
68 nF			-K0683-K60 ❍	-K0683-K62 ❍	
82 nF			-K0823-K62 ◆	-K0823-K62 ❍	
100 nF			-K0104-K62 ◆	-K0104-K62 ❍	
120 nF				-K0124-K62 ❍	
150 nF				-K0154-K62 ❍	
180 nF				-K0184-K62 ◆	
220 nF				-K0224-K62 ◆	

Chip thickness: ▲: 0,5 ± 0,05 mm ❑: 0,6 ± 0,1 mm
❍: 0,8 ± 0,1 mm ◆: 1,2 ± 0,1 mm

1) The tables contain the ordering code for chip capacitors, V_R = 25 Vdc
– with a capacitance tolerance of ± 10 %
– in the respective standard packing:
blister tape (last two digits of ordering code: 62) or cardboard tape (last two digits of ordering code: 60) on 180 mm diameter reels. For other versions refer to “Delivery Modes and Ordering Code”, page 113.

Ordering codes for standard chip capacitors, X7R/2R1, 50 Vdc, AgNiSn terminals

Size	0603	0805	1206	
C_R	Ordering code [1)]			
	B37931-	B37941-	B37872-	
220 pF	-K5221-K60 ❍			
270 pF	-K5271-K60 ❍			
330 pF	-K5331-K60 ❍			
390 pF	-K5391-K60 ❍			
470 pF	-K5471-K60 ❍	-K5471-K60 ❑		
560 pF	-K5561-K60 ❍	-K5561-K60 ❑		
680 pF	-K5681-K60 ❍	-K5681-K60 ❑		
820 pF	-K5821-K60 ❍	-K5821-K60 ❑		
1,0 nF	-K5102-K60 ❍	-K5102-K60 ❑	-K5102-K62 ❍	
1,2 nF	-K5122-K60 ❍	-K5122-K60 ❑	-K5122-K62 ❍	
1,5 nF	-K5152-K60 ❍	-K5152-K60 ❑	-K5152-K62 ❍	
1,8 nF	-K5182-K60 ❍	-K5182-K60 ❑	-K5182-K62 ❍	
2,2 nF	-K5222-K60 ❍	-K5222-K60 ❑	-K5222-K62 ❍	
2,7 nF	-K5272-K60 ❍	-K5272-K60 ❑	-K5272-K62 ❍	
3,3 nF	-K5332-K60 ❍	-K5332-K60 ❑	-K5332-K62 ❍	
3,9 nF	-K5392-K60 ❍	-K5392-K60 ❑	-K5392-K62 ❍	
4,7 nF	-K5472-K60 ❍	-K5472-K60 ❑	-K5472-K62 ❍	
5,6 nF	-K5562-K60 ❍	-K5562-K60 ❑	-K5562-K62 ❍	
6,8 nF	-K5682-K60 ❍	-K5682-K60 ❑	-K5682-K62 ❍	
8,2 nF	-K5822-K60 ❍	-K5822-K60 ❑	-K5822-K62 ❍	
10 nF	-K5103-K60 ❍	-K5103-K60 ❑	-K5103-K62 ❍	
12 nF		-K5123-K60 ❑	-K5123-K62 ❍	
15 nF		-K5153-K60 ❑	-K5153-K62 ❍	
18 nF		-K5183-K60 ❑	-K5183-K62 ❍	
22 nF		-K5223-K60 ❍	-K5223-K62 ❍	
27 nF		-K5273-K60 ❍	-K5273-K62 ❍	
33 nF		-K5333-K60 ❍	-K5333-K62 ❍	
39 nF		-K5393-K62 ◆	-K5393-K62 ❍	
47 nF		-K5473-K62 ◆	-K5473-K62 ❍	
56 nF		-K5563-K62 ◆	-K5563-K62 ❍	
68 nF		-K5683-K62 ◆	-K5683-K62 ❍	
82 nF		-K5823-K62 ◆	-K5823-K62 ❍	
100 nF		-K5104-K62 ◆	-K5104-K62 ❍	

continued on next page...

Chip thickness: ❑:0,6 ± 0,1 mm
❍:0,8 ± 0,1 mm
◆:1,2 ± 0,1 mm

Ordering codes for standard chip capacitors, X7R/2R1, 50 Vdc, AgNiSn terminals

Size	1210	1812	2220	
C_R	Ordering code [1)]			
	B37950-	B37953-	B37956-	
10 nF	-K5103-K62 ❍			
12 nF	-K5123-K62 ❍			
15 nF	-K5153-K62 ❍			
18 nF	-K5183-K62 ❍			
22 nF	-K5223-K62 ❍			
27 nF	-K5273-K62 ❍			
33 nF	-K5333-K62 ❍			
39 nF	-K5393-K62 ❍			
47 nF	-K5473-K62 ❍			
56 nF	-K5563-K62 ❍			
68 nF	-K5683-K62 ❍			
82 nF	-K5823-K62 ❍			
100 nF	-K5104-K62 ❍	-K5104-K62 ◆		
120 nF	-K5124-K62 ❍	-K5124-K62 ◆		
150 nF	-K5154-K62 ❍	-K5154-K62 ◆		
180 nF	-K5184-K62 ◆	-K5184-K62 ◆		
220 nF	-K5224-K62 ◆	-K5224-K62 ◆		
270 nF		-K5274-K62 ◆		
330 nF		-K5334-K62 ◆		
390 nF		-K5394-K62 ◆		
470 nF		-K5474-K62 ◆	-K5474-K62 ◆	
560 nF			-K5564-K62 ◆	
680 nF			-K5684-K62 ◆	
820 nF			-K5824-K62 ◆	
1,0 µF			-K5105-K62 ◆	

Chip thickness: ❑:0,6 ± 0,1 mm
❍:0,8 ± 0,1 mm
◆:1,2 ± 0,1 mm

1) The tables contain the ordering code for chip capacitors, V_R = 50 Vdc
– with a capacitance tolerance of ± 10 %
– in the respective standard packing:
blister tape (last two digits of ordering code: 62) or cardboard tape (last two digits of ordering code: 60) on 180 mm diameter reels. For other versions refer to “Delivery Modes and Ordering Code”, page 113.

Ordering codes for standard chip capacitors, X7R/2R1, 100 Vdc, AgNiSn terminals

Size	0805	1206	1210	
C_R	Ordering code [1]			
	B37941-	B37872-	B37950-	
470 pF	-K1471-K60 ❑			
560 pF	-K1561-K60 ❑			
680 pF	-K1681-K60 ❑			
820 pF	-K1821-K60 ❑			
1,0 nF	-K1102-K60 ❑	-K1102-K62 ❍		
1,2 nF	-K1122-K60 ❑	-K1122-K62 ❍		
1,5 nF	-K1152-K60 ❑	-K1152-K62 ❍		
1,8 nF	-K1182-K60 ❑	-K1182-K62 ❍		
2,2 nF	-K1222-K60 ❑	-K1222-K62 ❍		
2,7 nF	-K1272-K60 ❑	-K1272-K62 ❍		
3,3 nF	-K1332-K60 ❑	-K1332-K62 ❍		
3,9 nF	-K1392-K60 ❑	-K1392-K62 ❍		
4,7 nF	-K1472-K60 ❑	-K1472-K62 ❍		
5,6 nF	-K1562-K60 ❑	-K1562-K62 ❍		
6,8 nF	-K1682-K60 ❑	-K1682-K62 ❍		
8,2 nF	-K1822-K60 ❑	-K1822-K62 ❍		
10 nF	-K1103-K60 ❑	-K1103-K62 ❍	-K1103-K62 ❍	
12 nF	-K1123-K60 ❑	-K1123-K62 ❍	-K1123-K62 ❍	
15 nF	-K1153-K60 ❑	-K1153-K62 ❍	-K1153-K62 ❍	
18 nF		-K1183-K62 ❍	-K1183-K62 ❍	
22 nF		-K1223-K62 ❍	-K1223-K62 ❍	
27 nF		-K1273-K62 ❍	-K1273-K62 ❍	
33 nF		-K1333-K62 ❍	-K1333-K62 ❍	
39 nF		-K1393-K62 ❍	-K1393-K62 ❍	
47 nF		-K1473-K62 ❍	-K1473-K62 ❍	
56 nF		-K1563-K62 ◆	-K1563-K62 ❍	
68 nF		-K1683-K62 ◆	-K1683-K62 ❍	
82 nF			-K1823-K62 ❍	
100 nF			-K1104-K62 ❍	
120 nF			-K1124-K62 ◆	
150 nF			-K1154-K62 ◆	

Chip thickness: ❑:0,6 ± 0,1 mm
❍:0,8 ± 0,1 mm
◆:1,2 ± 0,1 mm

1) The tables contain the ordering code for chip capacitors, V_R = 100 Vdc
– with a capacitance tolerance of ± 10 %
– in the respective standard packing:
blister tape (last two digits of ordering code: 62) or cardboard tape (last two digits of ordering code: 60) on 180 mm diameter reels. For other versions refer to “Delivery Modes and Ordering Code”, page 113.

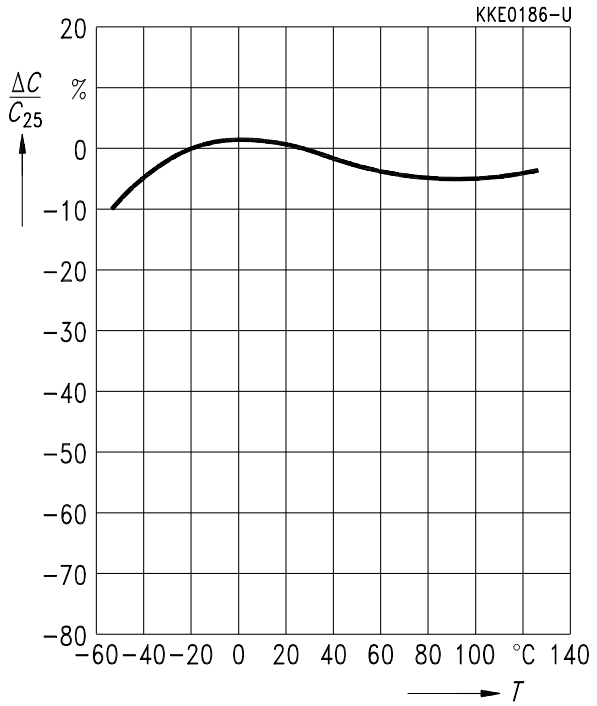
Ordering codes for chip capacitors, X7R/2R1, 25 V/50 Vdc, AgNiSn terminals, bulk case packing

Size	0603	0603	0805	1206	
V_R	25 V	50 V	50 V	50 V	
C_R	Ordering code [1]				
	B37931-	B37931-	B37941-	B37872-	
220 pF		-K5221-K01			
270 pF		-K5271-K01			
330 pF		-K5331-K01			
390 pF		-K5391-K01			
470 pF		-K5471-K01	-K5471-K01		
560 pF		-K5561-K01	-K5561-K01		
680 pF		-K5681-K01	-K5681-K01		
820 pF		-K5821-K01	-K5821-K01		
1,0 nF		-K5102-K01	-K5102-K01	-K5102-K01	
1,2 nF		-K5122-K01	-K5122-K01	-K5122-K01	
1,5 nF		-K5152-K01	-K5152-K01	-K5152-K01	
1,8 nF		-K5182-K01	-K5182-K01	-K5182-K01	
2,2 nF		-K5222-K01	-K5222-K01	-K5222-K01	
2,7 nF		-K5272-K01	-K5272-K01	-K5272-K01	
3,3 nF		-K5332-K01	-K5332-K01	-K5332-K01	
3,9 nF		-K5392-K01	-K5392-K01	-K5392-K01	
4,7 nF	-K0472-K01	-K5472-K01	-K5472-K01	-K5472-K01	
5,6 nF	-K0562-K01	-K5562-K01	-K5562-K01	-K5562-K01	
6,8 nF	-K0682-K01	-K5682-K01	-K5682-K01	-K5682-K01	
8,2 nF	-K0822-K01	-K5822-K01	-K5822-K01	-K5822-K01	
10 nF	-K0103-K01	-K5103-K01	-K5103-K01	-K5103-K01	
12 nF	-K0123-K01		-K5123-K01	-K5123-K01	
15 nF	-K0153-K01		-K5153-K01	-K5153-K01	
18 nF	-K0183-K01		-K5183-K01	-K5183-K01	
22 nF	-K0223-K01			-K5223-K01	
27 nF				-K5273-K01	
33 nF				-K5333-K01	
39 nF				-K5393-K01	
47 nF				-K5473-K01	

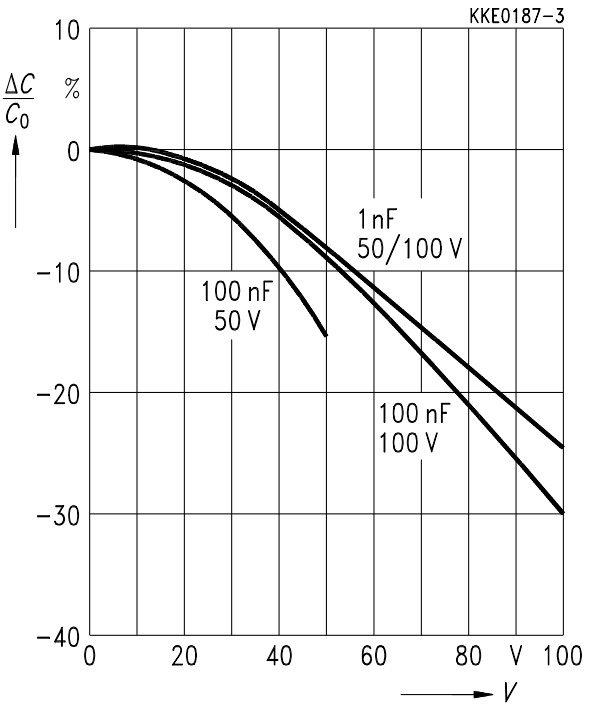
1) The tables contain the ordering code for chip capacitors, V_R = 25 Vdc or 50 Vdc, with a capacitance tolerance of ± 10 %. For other versions refer to “Delivery Modes and Ordering Code”, page 113.

Characteristics

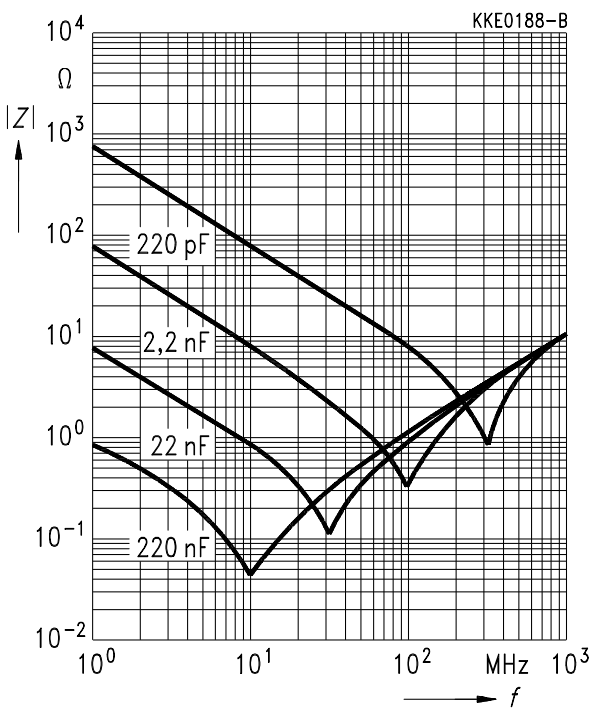
Capacitance change $\Delta C/C_{25}$ versus temperature T



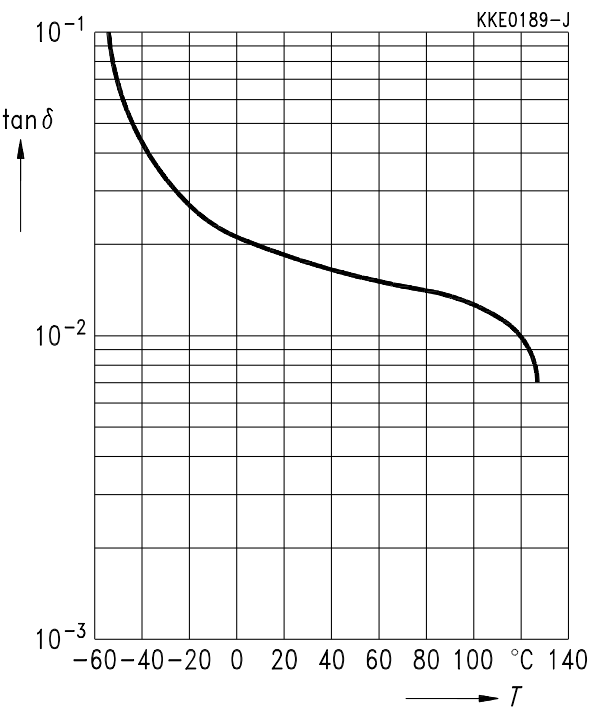
Capacitance change $\Delta C/C_0$ versus superimposed dc voltage V



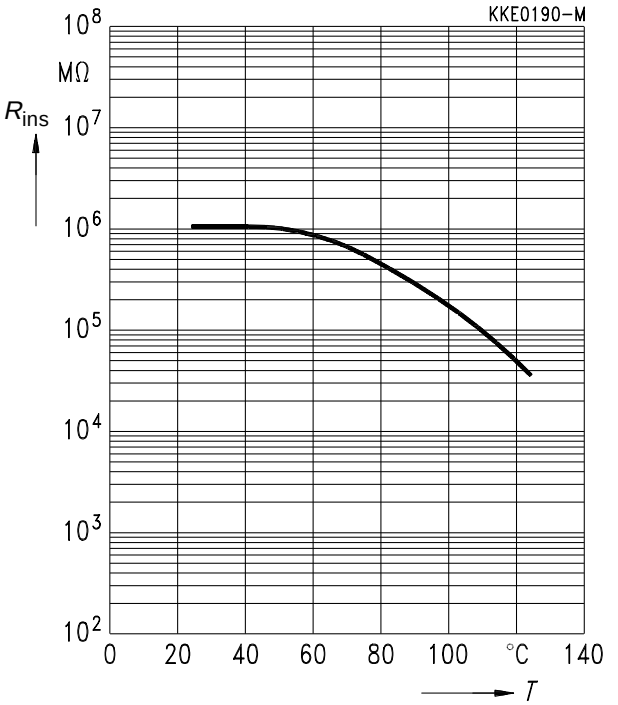
Impedance $|Z|$ versus frequency f



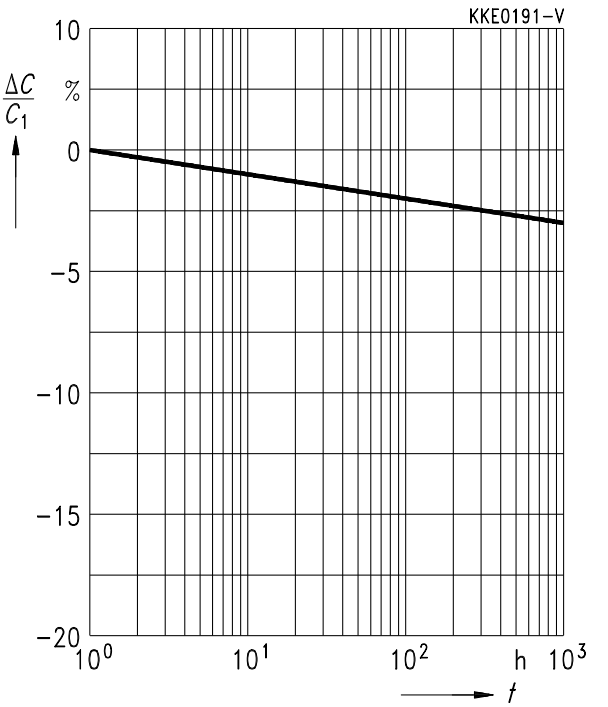
Dissipation factor tan δ versus temperature T



Insulation resistance R_{ins} versus temperature T



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



Features

- Extremely high volumetric efficiency
- Non-linear capacitance change

Applications

- Blocking
- Coupling
- Decoupling
- Interference suppression

Terminals

- For soldering:
  silver-nickel-tin
- For conductive adhesion:
  silver-nickel

Packing

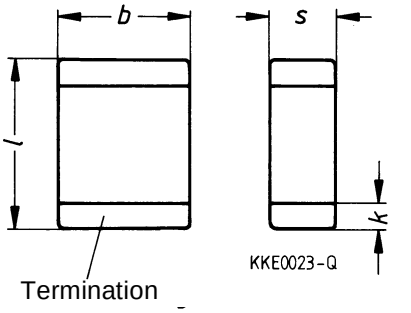
- Taping: blister and cardboard,
  for details refer to chapter
  “Taping and Packing”, page 105.
- Bulk case for sizes 0603, 0805
  and 1206, for details cf. page 107.

Marking

Upon request

Maximum ratings

Climatic category
in accordance with IEC 68-1: 30/85/56



Dimensions (mm)

Size	*l*	*b*	*s*	*k* [1]
0402	1,0 ± 0,1	0,5 ± 0,05	0,5 ± 0,05	0,2
0603	1,6 ± 0,15	0,8 ± 0,1	0,8 ± 0,1	0,3
0805	2,0 ± 0,2	1,25 ± 0,15	1,3 max.	0,5
1206	3,2 ± 0,2	1,6 ± 0,15	1,3 max.	0,5
1210	3,2 ± 0,2	2,5 ± 0,2	1,3 max.	0,5
1812	4,5 ± 0,2	3,2 ± 0,2	1,3 max.	0,5
2220	5,7 ± 0,2	5,0 ± 0,2	1,3 max.	0,5

For reduced height refer to slim-line
capacitors, page 55.

Available capacitance tolerances

$\Delta C_R/C_R$ = ± 20%, symbol: M

Rated voltage values

V_R = 25 V, 50 V [2]

1) Tolerances in accordance with CECC 32 101-801.
2) Also suitable for 63 V applications.

Ordering codes for standard chip capacitors, Z5U(Y5U)/2F4, 25 Vdc, AgNiSn terminals

Size	0402	0603	0805	1206	
C_R	Ordering code [1]				
	B37922-	B37932-	B37942-	B37873-	
2,2 nF	-K0222-M60 ▲				
3,3 nF	-K0332-M60 ▲				
4,7 nF	-K0472-M60 ▲				
6,8 nF	-K0682-M60 ▲				
10 nF	-K0103-M60 ▲				
15 nF					
22 nF		-K0223-M60 ❍			
33 nF		-K0333-M60 ❍			
47 nF		-K0473-M60 ❍	-K0473-M60 ❑		
68 nF		-K0683-M60 ❍	-K0683-M60 ❑		
100 nF		-K0104-M60 ❍	-K0104-M60 ❑		
150 nF			-K0154-M60 ❍	-K0154-M62 ❍	
220 nF			-K0224-M62 ◆	-K0224-M62 ❍	
330 nF			-K0334-M62 ◆	-K0334-M62 ❍	
470 nF				-K0474-M62 ◆	
680 nF				-K0684-M62 ◆	
1,0 µF				-K0105-M62 ◆	

Chip thickness: ▲: 0,5 ± 0,05 mm ❑: 0,6 ± 0,1 mm
❍: 0,8 ± 0,1 mm ◆: 1,2 ± 0,1 mm

1) The tables contain the ordering code for chip capacitors, V_R = 25 Vdc
– with a capacitance tolerance of ± 20 %
– in the respective standard packing:
blister tape (last two digits of ordering code: 62) or cardboard tape (last two digits of ordering code: 60) on 180 mm diameter reels. For other versions refer to “Delivery Modes and Ordering Code“, page 113.

Ordering codes for standard chip capacitors, Z5U(Y5U)/2F4, 50 Vdc, AgNiSn terminals

Size	0603	0805	1206	
C_R	Ordering code [1]			
	B37932-	B37942-	B37873-	
10 nF	-K5103-M60 ❍	-K5103-M60 ❑		
15 nF	-K5153-M60 ❍	-K5153-M60 ❑		
22 nF	-K5223-M60 ❍	-K5223-M60 ❑		
33 nF	-K5333-M60 ❍	-K5333-M60 ❑		
47 nF	-K5473-M60 ❍	-K5473-M60 ❑	-K5473-M62 ❍	
68 nF		-K5683-M62 ❍	-K5683-M62 ❍	
100 nF		-K5104-M62 ❍	-K5104-M62 ❍	
150 nF		-K5154-M62 ◆	-K5154-M62 ❍	
220 nF			-K5224-M62 ❍	
330 nF			-K5334-M62 ◆	
470 nF			-K5474-M62 ◆	

Size	1210	1812	2220	
C_R	Ordering code [1]			
	B37951-	B37954-	B37957-	
220 nF	-K5224-M62 ❍			
330 nF	-K5334-M62 ❍			
470 nF	-K5474-M62 ❍	-K5474-M62 ◆		
680 nF	-K5684-M62 ◆	-K5684-M62 ◆		
1 µF	-K5105-M62 ◆	-K5105-M62 ◆	-K5105-M62 ◆	
1,5 µF		-K5155-M62 ◆	-K5155-M62 ◆	
2,2 µF			-K5225-M62 ◆	
3,3 µF			-K5335-M62 ◆	
4,7 µF			-K5475-M62 ◆	

Chip thickness: ❑:0,6 ± 0,1 mm
❍:0,8 ± 0,1 mm
◆:1,2 ± 0,1 mm

1) The tables contain the ordering code for chip capacitors, V_R = 50 Vdc
– with a capacitance tolerance of ± 20 %
– in the respective standard packing:
blister tape (last two digits of ordering code: 62) or cardboard tape (last two digits of ordering code: 60) on 180 mm diameter reels. For other versions refer to “Delivery Modes and Ordering Code“, page 113.

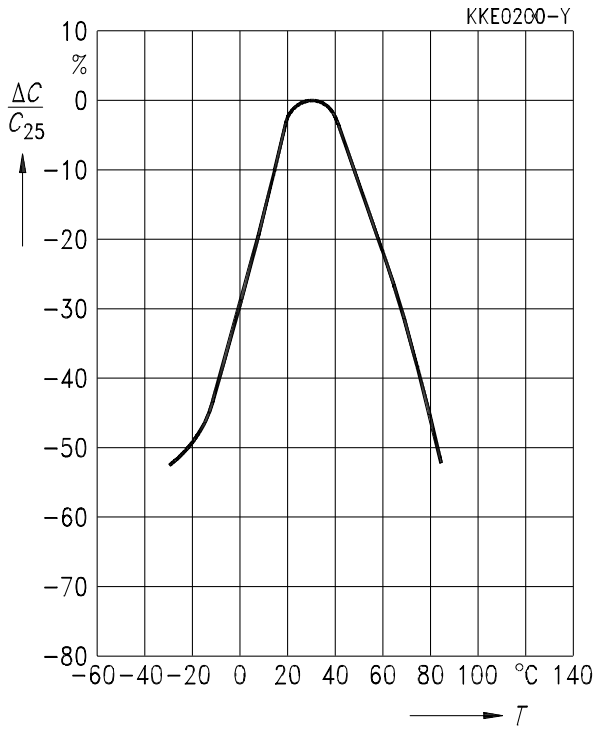
Ordering codes for chip capacitors,
Z5U(Y5U)/2F4, 25 V/50 Vdc, AgNiSn terminals, bulk case packing

Size	0603	0603	0805	1206	
V_R	25 V	50 V	50 V	50 V	
C_R	Ordering code [1]				
	B37932-	B37932-	B37942-	B37873-	
10 nF		-K5103-M01	-K5103-M01		
15 nF		-K5153-M01	-K5153-M01		
22 nF	-K0223-M01	-K5223-M01	-K5223-M01		
33 nF	-K0333-M01	-K5333-M01	-K5333-M01		
47 nF	-K0473-M01	-K5473-M01	-K5473-M01	-K5473-M01	
68 nF	-K0683-M01		-K5683-M01	-K5683-M01	
100 nF	-K0104-M01			-K5104-M01	
150 nF				-K5154-M01	

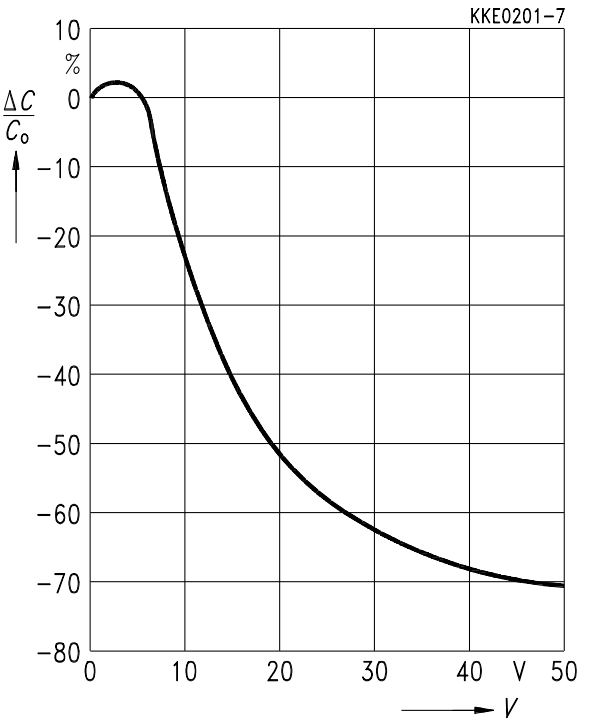
1) The tables contain the ordering code for chip capacitors, V_R = 25 Vdc or 50 Vdc, with a capacitance tolerance of ± 20 %. For other versions refer to “Delivery Modes and Ordering Code“, page 113.

Characteristics

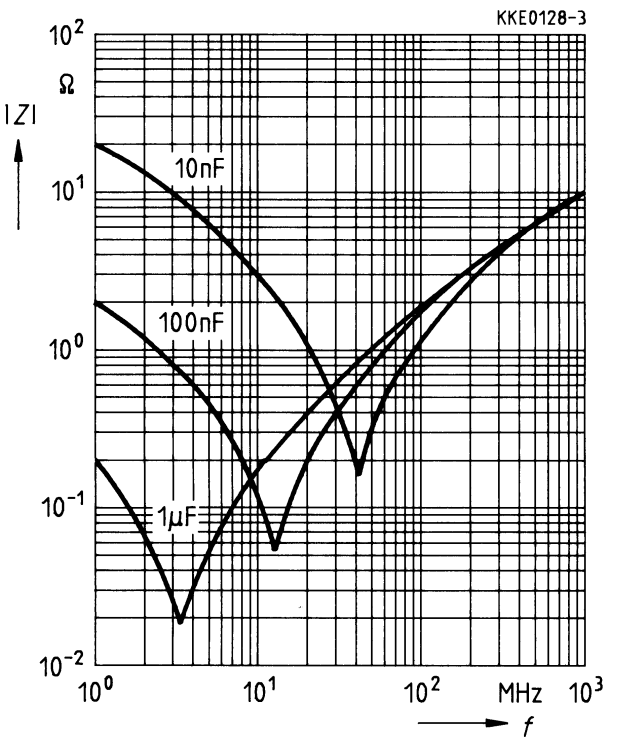
Capacitance change $\Delta C/C_{25}$ versus temperature T



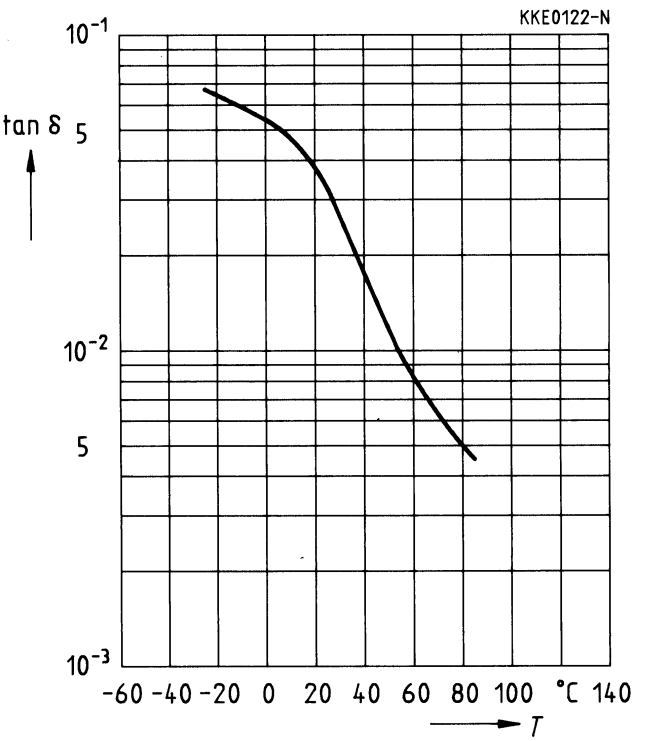
Capacitance change $\Delta C/C_0$ versus superimposed dc voltage V



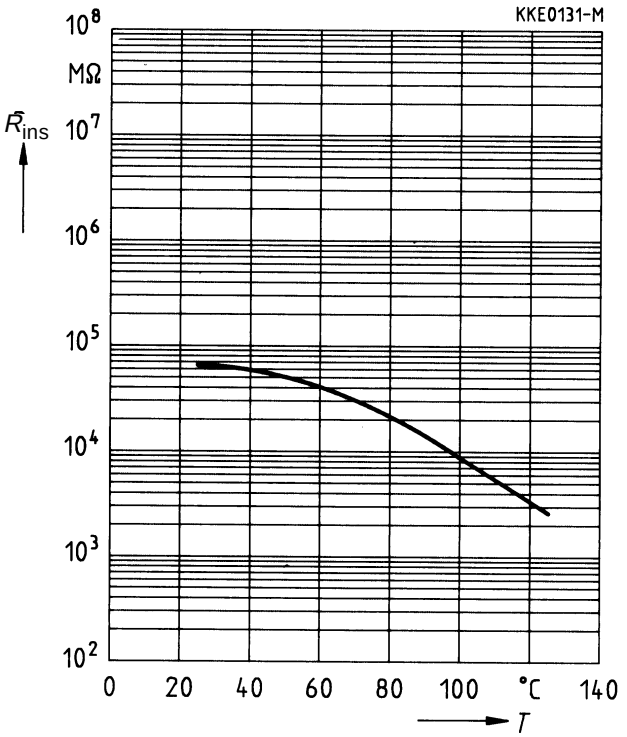
Impedance $|Z|$ versus frequency f



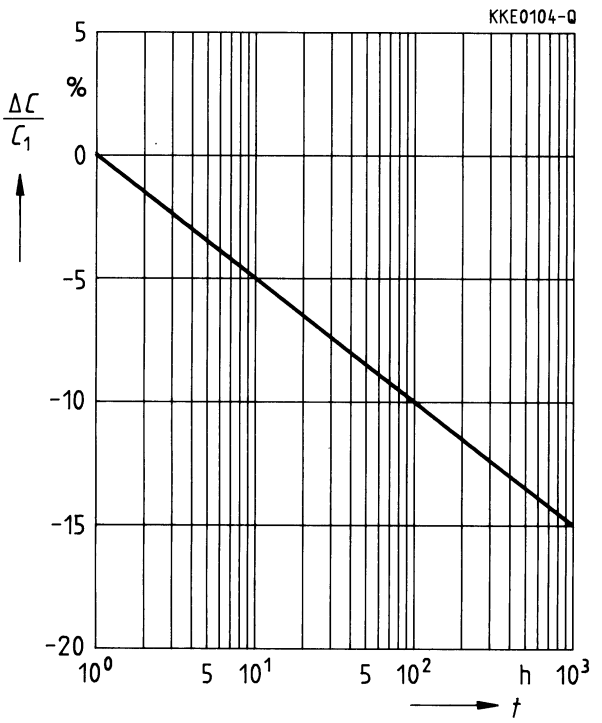
Dissipation factor tan δ versus temperature T



Insulation resistance R_{ins} versus temperature T



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

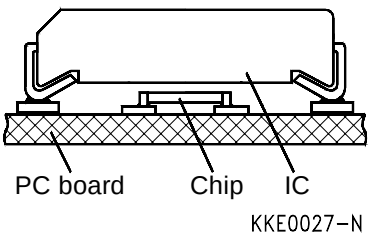


Features

- Thickness 0,6 mm
- High volumetric efficiency
- High pulse strength
- Suitable for wave and reflow soldering

Applications

- For mounting under integrated circuits



Terminals

- For soldering:
  silver-nickel-tin
- For conductive adhesion:
  silver-nickel

Packing

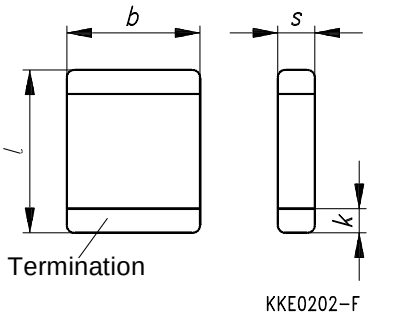
- Taping: blister and cardboard,
  for details refer to chapter
  “Taping and Packing”, page 105.
- Bulk case for sizes 0603, 0805
  und 1206, for details cf. page 107.

Marking

Upon request

Maximum ratings

Climatic category
in accordance with
IEC 68-1: 55/125/56 (C0G, X7R)
30/085/56 (Z5U (Y5U))



Dimensions (mm)

Size	*l*	*b*	*s*	*k*
0805	2,0 ± 0,2	1,25 ± 0,15	0,6 ± 0,1	0,5
1206	3,2 ± 0,2	1,6 ± 0,15	0,6 ± 0,1	0,5
1210	3,2 ± 0,2	2,5 ± 0,2	0,6 ± 0,1	0,5

Available capacitance tolerances

Tolerance	Symbol
$\Delta C_R/C_R = \pm$ 5 % (C0G)	J
$\Delta C_R/C_R = \pm$ 10 % (C0G, X7R)	K
$\Delta C_R/C_R = \pm$ 20 % (X7R, Z5U)	M

Rated voltage values

V_R = 25 V, 50 V [1)]

1) Also suitable for 63 V applications.

Ordering codes for slim-line chip capacitors, 50 Vdc, AgNiSn terminals

Ceramic material	C0G			X7R		
Size	0805	1206	1210	0805	1206	1210
C_R	Ordering code [1)]					
	B37940-	B37871-	B37949-	B37941-	B37872-	B37950-
1,0 pF	-D5010-C60	-D5010-C62				
1,2 pF	-D5010-C260	-D5010-C262				
1,5 pF	-D5010-C560	-D5010-C562				
1,8 pF	-D5010-C860	-D5010-C862				
2,2 pF	-D5020-C260	-D5020-C262				
2,7 pF	-D5020-C760	-D5020-C762				
3,3 pF	-D5030-C360	-D5030-C362				
3,9 pF	-D5030-C960	-D5030-C962				
4,7 pF	-D5040-C760	-D5040-C762				
5,6 pF	-D5050-C660	-D5050-C662				
6,8 pF	-D5060-C860	-D5060-C862				
8,2 pF	-D5080-C260	-D5080-C262				
10 pF	-D5100-J60	-D5100-J62				
12 pF	-D5120-J60	-D5120-J62				
15 pF	-D5150-J60	-D5150-J62				
18 pF	-D5180-J60	-D5180-J62				
22 pF	-D5220-J60	-D5220-J62				
27 pF	-D5270-J60	-D5270-J62				
33 pF	-D5330-J60	-D5330-J62				
39 pF	-D5390-J60	-D5390-J62				
47 pF	-D5470-J60	-D5470-J62				
56 pF	-D5560-J60	-D5560-J62				
68 pF	-D5680-J60	-D5680-J62				
82 pF	-D5820-J60	-D5820-J62				
100 pF	-D5101-J60	-D5101-J62				
120 pF	-D5121-J60	-D5121-J62				
150 pF	-D5151-J60	-D5151-J62				
180 pF	-D5181-J60	-D5181-J62				
220 pF	-D5221-J60	-D5221-J62				
270 pF	-D5271-J60	-D5271-J62				
330 pF	-D5331-J60	-D5331-J62				
390 pF	-D5391-J60	-D5391-J62				
470 pF	-D5471-J60	-D5471-J62		-D5471-K60		
560 pF	-D5561-J60	-D5561-J62		-D5561-K60		
680 pF	-D5681-J60	-D5681-J62		-D5681-K60		
820 pF	-D5821-J60	-D5821-J62		-D5821-K60		
1,0 nF	-D5102-J60	-D5102-J62		-D5102-K60	-D5102-K60	
1,2 nF		-D5122-J62		-D5122-K60	-D5122-K62	

continued on next page...

Ordering codes for slim-line chip capacitors, 50 Vdc, AgNiSn terminals

Ceramic material	C0G			X7R		
Size	0805	1206	1210	0805	1206	1210
C_R	Ordering code [1]					
	B37940-	B37871-	B37949-	B37941-	B37872-	B37950-
1,5 nF		-D5152-J62		-D5152-K60	-D5152-K62	
1,8 nF		-D5182-J62		-D5182-K60	-D5182-K62	
2,2 nF		-D5222-J62		-D5222-K60	-D5222-K62	
2,7 nF			-D5272-J62	-D5272-K60	-D5272-K62	
3,3 nF			-D5332-J62	-D5332-K60	-D5332-K62	
3,9 nF			-D5392-J62	-D5392-K60	-D5392-K62	
4,7 nF			-D5472-J62	-D5472-K60	-D5472-K62	
5,6 nF				-D5560-K60	-D5562-K62	
6,8 nF				-D5682-K60	-D5682-K62	
8,2 nF				-D5822-K60	-D5822-K62	
10 nF				-D5103-K60	-D5103-K62	-D5103-K62
12 nF				-D5123-K60	-D5123-K62	-D5123-K62
15 nF				-D5153-K60	-D5153-K62	-D5153-K62
18 nF				-D5183-K60	-D5183-K62	-D5183-K62
22 nF					-D5223-K62	-D5223-K62
27 nF					-D5273-K62	-D5273-K62
33 nF					-D5333-K62	-D5333-K62
39 nF					-D5393-K62	-D5393-K62
47 nF					-D5473-K62	-D5473-K62
56 nF						-D5563-K62
68 nF						-D5683-K62
82 nF						-D5823-K62
100 nF						-D5104-K62

1) The tables contain the ordering code for slim-line capacitors, V_R = 50 Vdc
– with a capacitance tolerance of ± 5 % (C0G) or ± 10 % (X7R), respectively
– in the respective standard packing:
blister tape (last two digits of ordering code: 62) or cardboard tape (last two digits of ordering code: 60) on 180 mm diameter reels. For other versions refer to “Delivery Modes and Ordering Code“, page 113.

Ordering codes for slim-line chip capacitors, 25 Vdc, AgNiSn terminals

Ceramic material	Z5U		
Size	0805	1206	
C_R	Ordering code [1)]		
	B37942-	B37873-	
47 nF	-D0473-M62		
68 nF	-D0683-M62		
100 nF	-D0104-M62		
150 nF		-D0154-M62	
220 nF		-D0224-M62	
330 nF		-D0334-M62	

Ordering codes for slim-line chip capacitors, 50 Vdc, AgNiSn terminals

Ceramic material	Z5U			
Size	0805	1206	1210	
C_R	Ordering code [1)]			
	B37942-	B37873-	B37951-	
10 nF	-D5103-M62			
15 nF	-D5153-M62			
22 nF	-D5223-M62			
33 nF	-D5333-M62			
47 nF	-D5473-M62	-D5473-M62		
68 nF	-D5683-M62	-D5683-M62		
100 nF		-D5104-M62		
150 nF		-D5154-M62		
220 nF			-D5224-M62	
330 nF			-D5334-M62	

Characteristics

Refer to standard chips.
The characteristics are identical for the same respective temperature characteristics.

1) The tables contain the ordering code for slim-line capacitors
– with a capacitance tolerance of ± 20 %
– on blister tape on 180 mm diameter reel.
For other versions refer to “Delivery Modes and Ordering Code“, page 113.

Leaded Capacitors, EIA Standard
C0G

Features

- Good thermal stability
- High insulation resistance
- Low dissipation factor
- Low inductance

Applications

- Resonant circuits
- Filter circuits
- Timing elements
- Coupling and filtering, particularly in RF circuits

Terminals

- Parallel wire leads, iron-nickel, tinned
- Crimped leads
- Non-standard lead lengths on request

Marking

- Rated capacitance, tolerance, manufacturer's logo, ceramic material, voltage

Packing

Optionally

- Taped (reel or Ammo pack)
- Bulk

Maximum ratings

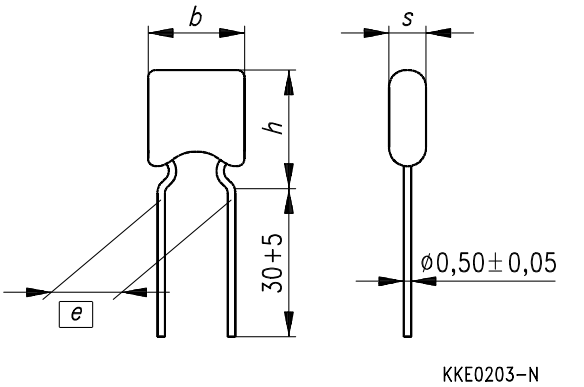
- Climatic category in accordance with IEC 68-1: 55/125/56

Available capacitance tolerances

Rated capacitance C_R	Tolerance	Symbol
C_R < 10 pF:	ΔC_R = ± **0,5 pF**	**D** [1]
	ΔC_R = ± 1,0 pF	F
$C_R \geq$ 10 pF:	$\Delta C_R/C_R$ = ± **5 %**	**J** [1]
	$\Delta C_R/C_R$ = ± 10 %	K

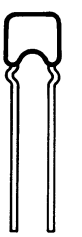
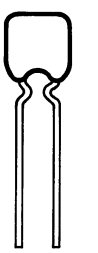
Rated voltage values

V_R = 50 V [2], 100 V

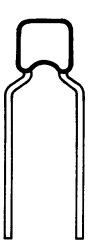
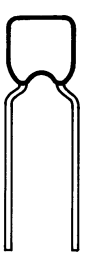


Dimensions (mm)

Lead spacing e = 2,5 $^{+0,6}_{-0,1}$ mm

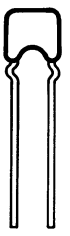
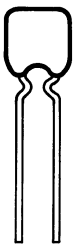
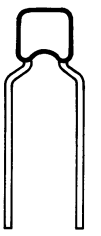
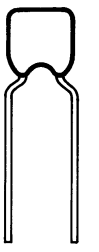
h_{max}	5,5	6,5
b_{max}	5,0	5,0
s_{max}	2,5	2,5
		
Type	B37979-N	B37986-N

Lead spacing e = 5,0 $^{+0,6}_{-0,1}$ mm

h_{max}	5,5	6,5
b_{max}	5,0	5,0
s_{max}	2,5	2,5
		
Type	B37979-G	B37986-G

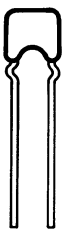
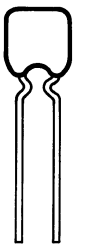
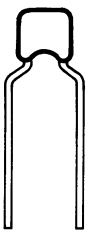
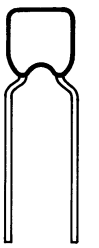
1) Standard tolerance
2) Also suitable for 63 V applications.

Ordering codes for capacitors with radial crimped leads, 50 Vdc

Lead spacing	2,5 mm		5,0 mm	
				
$h \times b \times s$ (mm)	5,5 × 5,0 × 2,5	6,5 × 5,0 × 2,5	5,5 × 5,0 × 2,5	6,5 × 5,0 × 2,5
C_R	Ordering code [1]			
	B37979-	B37986-	B37979-	B37986-
100 pF	-N5101-J51		-G5101-J51	
120 pF	-N5121-J51		-G5121-J51	
150 pF	-N5151-J51		-G5151-J51	
180 pF	-N5181-J51		-G5181-J51	
220 pF	-N5221-J51		-G5221-J51	
270 pF	-N5271-J51		-G5271-J51	
330 pF	-N5331-J51		-G5331-J51	
390 pF	-N5391-J51		-G5391-J51	
470 pF	-N5471-J51		-G5471-J51	
560 pF	-N5561-J51		-G5561-J51	
680 pF	-N5681-J51		-G5681-J51	
820 pF	-N5821-J51		-G5821-J51	
1,0 nF	-N5102-J51		-G5102-J51	
1,2 nF	-N5122-J51		-G5122-J51	
1,5 nF	-N5152-J51		-G5152-J51	
1,8 nF	-N5182-J51		-G5182-J51	
2,2 nF	-N5222-J51		-G5222-J51	
2,7 nF		-N5272-J51		-G5272-J51
3,3 nF		-N5332-J51		-G5332-J51
3,9 nF		-N5392-J51		-G5392-J51
4,7 nF		-N5472-J51		-G5472-J51
5,6 nF		-N5562-J51		-G5562-J51
6,8 nF		-N5682-J51		-G5682-J51
8,2 nF		-N5822-J51		-G5822-J51
10 nF		-N5103-J51		-G5103-J51

1) The tables contain the ordering code for capacitors with radial crimped leads (EIA standard), V_R = 50 Vdc
– taped, reel packing
– with a capacitance tolerance of ± 5 %
For other versions refer to “Delivery Modes and Ordering Code“, page 114.

Ordering codes for capacitors with radial crimped leads, 100 Vdc

Lead spacing	2,5 mm		5,0 mm	
				
$h \times b \times s$ (mm)	5,5 × 5,0 × 2,5	6,5 × 5,0 × 2,5	5,5 × 5,0 × 2,5	6,5 × 5,0 × 2,5
C_R	Ordering code [1]			
	B37979-	B37986-	B37979-	B37986-
10 pF	-N1100-J51		-G1100-J51	
12 pF	-N1120-J51		-G1120-J51	
15 pF	-N1150-J51		-G1150-J51	
18 pF	-N1180-J51		-G1180-J51	
22 pF	-N1220-J51		-G1220-J51	
27 pF	-N1270-J51		-G1270-J51	
33 pF	-N1330-J51		-G1330-J51	
39 pF	-N1390-J51		-G1390-J51	
47 pF	-N1470-J51		-G1470-J51	
56 pF	-N1560-J51		-G1560-J51	
68 pF	-N1680-J51		-G1680-J51	
82 pF	-N1820-J51		-G1820-J51	
100 pF	-N1101-J51		-G1101-J51	
120 pF	-N1121-J51		-G1121-J51	
150 pF	-N1151-J51		-G1151-J51	
180 pF	-N1181-J51		-G1181-J51	
220 pF	-N1221-J51		-G1221-J51	
270 pF	-N1271-J51		-G1271-J51	
330 pF	-N1331-J51		-G1331-J51	
390 pF	-N1391-J51		-G1391-J51	
470 pF	-N1471-J51		-G1471-J51	
560 pF	-N1561-J51		-G1561-J51	
680 pF	-N1681-J51		-G1681-J51	
820 pF	-N1821-J51		-G1821-J51	
1,0 nF	-N1102-J51		-G1102-J51	
1,2 nF		-N1122-J51		-G1122-J51
1,5 nF		-N1152-J51		-G1152-J51
1,8 nF		-N1182-J51		-G1182-J51
2,2 nF		-N1222-J51		-G1222-J51

Characteristics: compare with standard chip capacitors.

1) The tables contain the ordering code for capacitors with radial crimped leads (EIA standard), V_R = 100 Vdc
– taped, reel packing
– with a capacitance tolerance of ± 5 % (for C_R < 10 pF: ΔC_R = ± 0,5 pF)
For other versions refer to “Delivery Modes and Ordering Code“, page 114.

Features

- High volumetric efficiency
- Non-linear capacitance change
- High insulation resistance
- High pulse strength

Applications

- Blocking
- Coupling
- Decoupling
- Interference suppression

Terminals

- Parallel wire leads
  iron-nickel, tinned
- Crimped leads
- Non-standard lead lengths on request

Marking

- Rated capacitance, tolerance, manufacturer's logo, ceramic material, voltage

Packing

Optionally

- Taped (reel or Ammo pack)
- Bulk

Maximum ratings

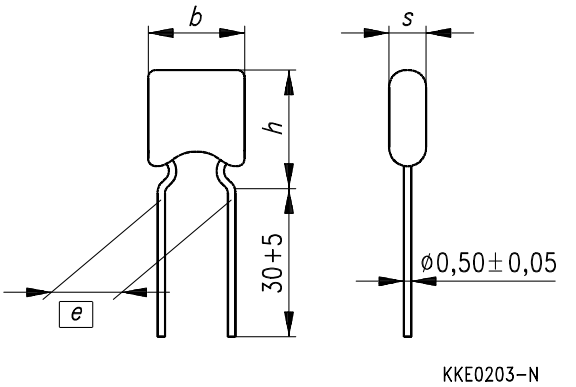
- Climatic category
  in accordance with IEC 68-1: 55/125/56

Available capacitance tolerances

Tolerance	Symbol
$\Delta C_R/C_R = \pm$ **10 %**	**K**
$\Delta C_R/C_R = \pm$ 20 %	M

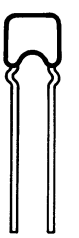
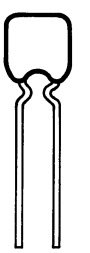
Rated voltage values

V_R = 50 V [2], 100 V

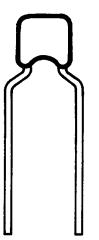
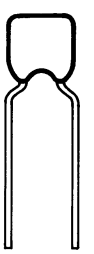
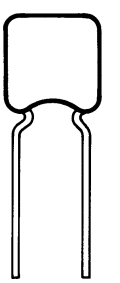


Dimensions (mm)

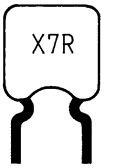
Lead spacing e = 2,5 $^{+0,6}_{-0,1}$ mm

h_{max}	5,5	6,5
b_{max}	5,0	5,0
s_{max}	2,5	2,5
		
Type	B37981-M	B37987-M

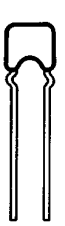
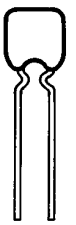
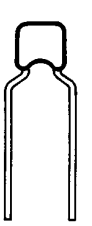
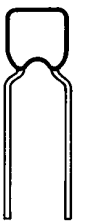
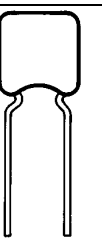
Lead spacing e = 5,0 $^{+0,6}_{-0,1}$ mm

h_{max}	5,5	6,5	9,0
b_{max}	5,0	5,0	7,5
s_{max}	2,5	2,5	2,5
			
Type	B37981-F	B37987-F	B37984-M

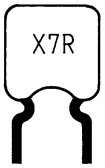
1) Standard tolerance
2) Also suitable for 63 V applications.



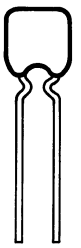
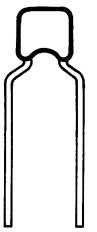
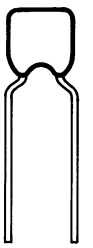
Ordering codes for capacitors with radial crimped leads, 50 Vdc

Lead spacing	2,5 mm		5,0 mm		
					
$h \times b \times s$ (mm)	5,5 × 5,0 × 2,5	6,5 × 5,0 × 2,5	5,5 × 5,0 × 2,5	6,5 × 5,0 × 2,5	9,0 × 7,5 × 2,5
C_R	Ordering code [1]				
	B37981-	B37987-	B37981-	B37987-	B37984-
3,3 nF	-M5332-K51		-F5332-K51		
3,9 nF	-M5392-K51		-F5392-K51		
4,7 nF	-M5472-K51		-F5472-K51		
5,6 nF	-M5562-K51		-F5562-K51		
6,8 nF	-M5682-K51		-F5682-K51		
8,2 nF	-M5822-K51		-F5822-K51		
10 nF	-M5103-K51		-F5103-K51		
12 nF	-M5123-K51		-F5123-K51		
15 nF	-M5153-K51		-F5153-K51		
18 nF	-M5183-K51		-F5183-K51		
22 nF	-M5223-K51		-F5223-K51		
27 nF	-M5273-K51		-F5273-K51		
33 nF	-M5333-K51		-F5333-K51		
39 nF	-M5393-K51		-F5393-K51		
47 nF	-M5473-K51		-F5473-K51		
56 nF		-M5563-K51		-F5563-K51	
68 nF		-M5683-K51		-F5683-K51	
82 nF		-M5823-K51		-F5823-K51	
100 nF		-M5104-K51		-F5104-K51	
120 nF		-M5124-K51		-F5124-K51	
150 nF		-M5154-K51		-F5154-K51	
180 nF		-M5184-K51		-F5184-K51	
220 nF		-M5224-K51		-F5224-K51	
270 nF					-M5274-K51
330 nF					-M5334-K51
390 nF					-M5394-K51
470 nF					-M5474-K51
560 nF					-M5564-K51
680 nF					-M5684-K51
820 nF					-M5824-K51
1,0 µF					-M5105-K51

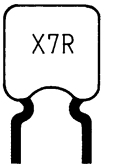
1) The tables contain the ordering code for capacitors with radial crimped leads (EIA standard), V_R = 50 Vdc
– taped, reel packing
– with a capacitance tolerance of ± 10 %
For other versions refer to “Delivery Modes and Ordering Code“,page 114 .



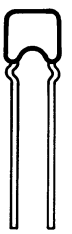
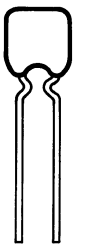
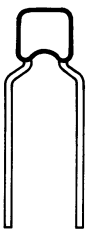
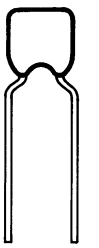
Ordering codes for capacitors with radial crimped leads, 100 Vdc

Lead spacing	2,5 mm		5,0 mm	
				
$h \times b \times s$ (mm)	5,5 × 5,0 × 2,5	6,5 × 5,0 × 2,5	5,5 × 5,0 × 2,5	6,5 × 5,0 × 2,5
C_R	Ordering code [1]			
	B37981-	B37987-	B37981-	B37987-
470 pF	-M1471-K51		-F1471-K51	
560 pF	-M1561-K51		-F1561-K51	
680 pF	-M1681-K51		-F1681-K51	
820 pF	-M1821-K51		-F1821-K51	
1,0 nF	-M1102-K51		-F1102-K51	
1,2 nF	-M1122-K51		-F1122-K51	
1,5 nF	-M1152-K51		-F1152-K51	
1,8 nF	-M1182-K51		-F1182-K51	
2,2 nF	-M1222-K51		-F1222-K51	
2,7 nF	-M1272-K51		-F1272-K51	
3,3 nF	-M1332-K51		-F1332-K51	
3,9 nF	-M1392-K51		-F1392-K51	
4,7 nF	-M1472-K51		-F1472-K51	
5,6 nF	-M1562-K51		-F1562-K51	
6,8 nF	-M1682-K51		-F1682-K51	
8,2 nF	-M1822-K51		-F1822-K51	
10 nF	-M1103-K51		-F1103-K51	
12 nF	-M1123-K51		-F1123-K51	
15 nF	-M1153-K51		-F1153-K51	
18 nF		-M1183-K51		-F1183-K51
22 nF		-M1223-K51		-F1223-K51
27 nF		-M1273-K51		-F1273-K51
33 nF		-M1333-K51		-F1333-K51
39 nF		-M1393-K51		-F1393-K51
47 nF		-M1473-K51		-F1473-K51
56 nF		-M1563-K51		-F1563-K51
68 nF		-M1683-K51		-F1683-K51
82 nF		-M1823-K51		-F1823-K51

continued on next page ...



Ordering codes for capacitors with radial crimped leads, 100 Vdc

Lead spacing	2,5 mm		5,0 mm	
				
$h \times b \times s$ (mm)	5,5 × 5,0 × 2,5	6,5 × 5,0 × 2,5	5,5 × 5,0 × 2,5	6,5 × 5,0 × 2,5
C_R	Ordering code [1]			
	B37981-	B37987-	B37981-	B37987-
100 nF		-M1104-K51		-F1104-K51
120 nF		-M1124-K51		-F1124-K51
150 nF		-M1154-K51		-F1154-K51

Characteristics:

Compare with standard chip capacitors.

1) The tables contain the ordering code for capacitors with radial crimped leads (EIA standard), V_R = 100 Vdc
– taped, reel packing
– with a capacitance tolerance of ± 10 %
For other versions refer to “Delivery Modes and Ordering Code”, page 114.

Features

- Extremely high volumetric efficiency
- Non-linear capacitance change

Applications

- Blocking
- Coupling
- Decoupling
- Interference suppression

Terminals

- Parallel wire leads
  iron-nickel, tinned
- Crimped leads
- Non-standard lead lengths on request

Marking

- Rated capacitance, tolerance, manufacturer's logo, ceramic material, voltage

Packing

Optionally

- Taped (reel or Ammo pack)
- Bulk

Maximum ratings

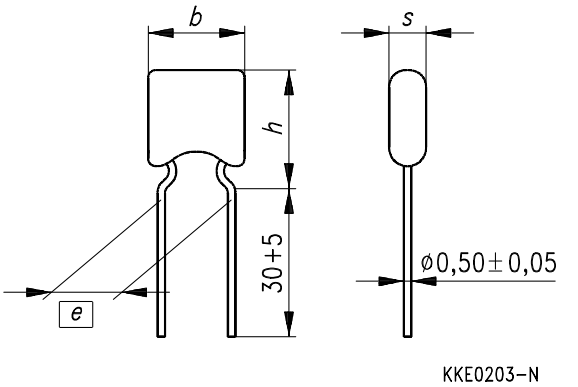
- Climatic category
  in accordance with IEC 68-1: 25/085/56

Available capacitance tolerances

$\Delta C_R/C_R = \pm 20$ %, symbol: M

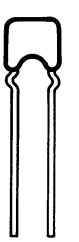
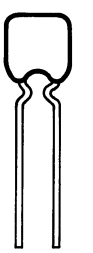
Rated voltage values

$V_R = 50$ V [1)]

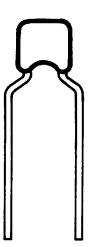
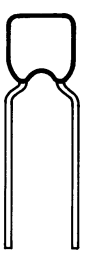
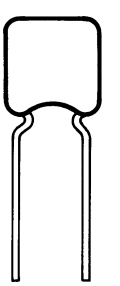


Dimensions (mm)

Lead spacing e = 2,5 $^{+0,6}_{-0,1}$ mm

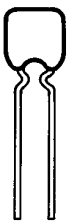
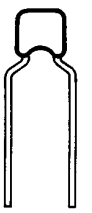
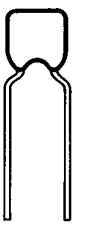
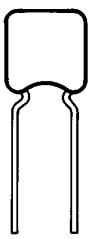
h_{max}	5,5	6,5
b_{max}	5,0	5,0
s_{max}	2,5	2,5
		
Type	B37982-M	B37988-M

Lead spacing e = 5,0 $^{+0,6}_{-0,1}$ mm

h_{max}	5,5	6,5	9,0
b_{max}	5,0	5,0	7,5
s_{max}	2,5	2,5	2,5
			
Type	B37982-G	B37988-G	B37985-N

1) Also suitable for 63 V applications.

Ordering codes for capacitors with radial crimped leads, 50 Vdc

Lead spacing	2,5 mm		5,0 mm		
					
$h \times b \times s$ (mm)	5,5 × 5,0 × 2,5	6,5 × 5,0 × 2,5	5,5 × 5,0 × 2,5	6,5 × 5,0 × 2,5	9,0 × 7,5 × 2,5
C_R	Ordering code [1]				
	B37982-	B37988-	B37982-	B37988-	B37985-
10 nF	-N5103-M51		-G5103-M51		
15 nF	-N5153-M51		-G5153-M51		
22 nF	-N5223-M51		-G5223-M51		
33 nF	-N5333-M51		-G5333-M51		
47 nF	-N5473-M51		-G5473-M51		
68 nF	-N5683-M51		-G5683-M51		
100 nF	-N5104-M51		-G5104-M51		
150 nF	-N5154-M51		-G5154-M51		
220 nF		-N5224-M51		-G5224-M51	
330 nF		-N5334-M51		-G5334-M51	
470 nF		-N5474-M51		-G5474-M51	
680 nF		-N5684-M51		-G5684-M51	
1,0 µF		-N5105-M51		-G5105-M51	
1,5 µF					-N5155-M51
2,2 µF					-N5225-M51
3,3 µF					-N5335-M51
4,7 µF					-N5475-M51

Characteristics:

Compare with standard chip capacitors.

1) The tables contain the ordering code for capacitors with radial crimped leads (EIA standard),
– taped, reel packing
– with a capacitance tolerance of ± 20 %
For other versions refer to “Delivery Modes and Ordering Code”, page 114.

Features

- Good thermal stability
- High insulation resistance
- Low dissipation factor
- Low inductance

Applications

- Resonant circuits
- Filter circuits
- Timing elements
- Coupling and filtering, particularly in RF circuits

Terminals

- Parallel wire leads iron-nickel, tinned
- Straight leads
- Non-standard lead lengths on request

Marking

- Rated capacitance, tolerance, manufacturer's logo, ceramic material, voltage

Packaging

Optionally

- Taped (reel or Ammo pack)
- Bulk

Maximum ratings

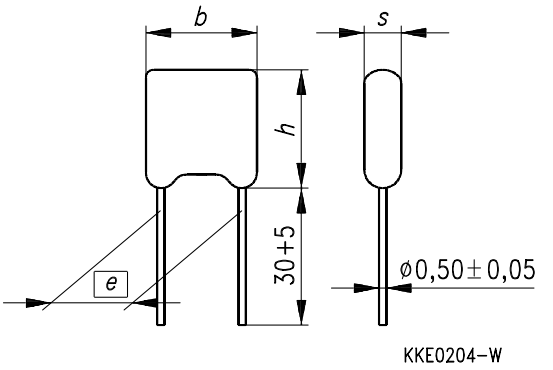
- Climatic category in accordance with IEC 68-1: 55/125/56

Available capacitance tolerances

Rated capacitance C_R	Tolerance	Symbol
C_R < 10 pF:	ΔC_R = ± **0,5 pF**	**D** [1]
	ΔC_R = ± 1,0 pF	F
$C_R \geq$ 10 pF:	$\Delta C_R/C_R$ = ± **5 %**	**J** [1]
	$\Delta C_R/C_R$ = ± 10 %	K

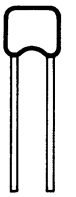
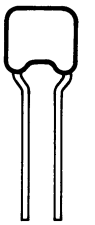
Rated voltage values

V_R = 50 V [2], 100 V

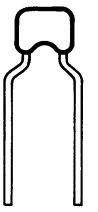
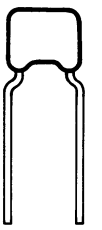


Dimensions (mm)

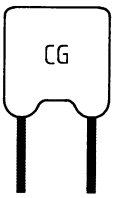
Lead spacing e = 2,5 $^{+0,6}_{-0,1}$ mm

h_{max}	5,5	6,5
b_{max}	3,8	5,0
s_{max}	2,5	2,5
		
Type	B37979-K	B37986-K

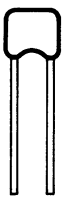
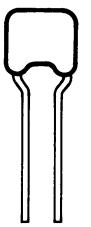
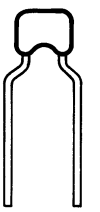
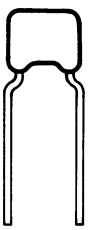
Lead spacing e = 5,0 $^{+0,6}_{-0,1}$ mm

h_{max}	5,5	6,5
b_{max}	3,8	5,0
s_{max}	2,5	2,5
		
Type	B37979-D	B37986-D

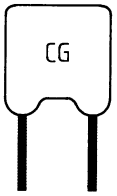
1) Standard tolerance
2) Also suitable for 63 V applications



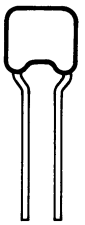
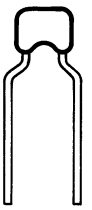
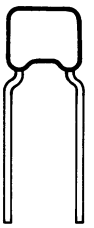
Ordering codes for capacitors with radial straight leads, 50 Vdc

Lead spacing	2,5 mm		5,0 mm	
				
$h \times b \times s$ (mm)	5,5 × 3,8 × 2,5	6,5 × 5,0 × 2,5	5,5 × 3,8 × 2,5	6,5 × 5,0 × 2,5
C_R	Ordering code [1]			
	B37979-	B37986-	B37979-	B37986-
100 pF	-K5101-J51		-D5101-J51	
120 pF	-K5121-J51		-D5121-J51	
150 pF	-K5151-J51		-D5151-J51	
180 pF	-K5181-J51		-D5181-J51	
220 pF	-K5221-J51		-D5221-J51	
270 pF	-K5271-J51		-D5271-J51	
330 pF	-K5331-J51		-D5331-J51	
390 pF	-K5391-J51		-D5391-J51	
470 pF	-K5471-J51		-D5471-J51	
560 pF	-K5561-J51		-D5561-J51	
680 pF	-K5681-J51		-D5681-J51	
820 pF	-K5821-J51		-D5821-J51	
1,0 nF	-K5102-J51		-D5102-J51	
1,2 nF	-K5122-J51		-D5122-J51	
1,5 nF	-K5152-J51		-D5152-J51	
1,8 nF	-K5182-J51		-D5182-J51	
2,2 nF	-K5222-J51		-D5222-J51	
2,7 nF		-K5272-J51		-D5272-J51
3,3 nF		-K5332-J51		-D5332-J51
3,9 nF		-K5392-J51		-D5392-J51
4,7 nF		-K5472-J51		-D5472-J51
5,6 nF		-K5562-J51		-D5562-J51
6,8 nF		-K5682-J51		-D5682-J51
8,2 nF		-K5822-J51		-D5822-J51
10 nF		-K5103-J51		-D5103-J51

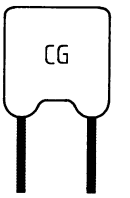
1) The tables contain the ordering code for capacitors with radial straight leads (CECC standard), V_R = 50 Vdc
– taped, reel packing
– with a capacitance tolerance of ± 5 %
For other versions refer to “Delivery Modes and Ordering Code”, page 115.



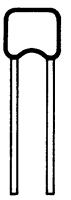
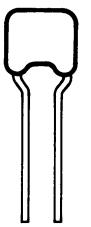
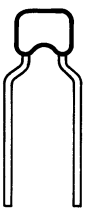
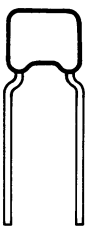
Ordering codes for capacitors with radial straight leads, 100 Vdc

Lead spacing	2,5 mm		5,0 mm	
				
$h \times b \times s$ (mm)	5,5 × 3,8 × 2,5	6,5 × 5,0 × 2,5	5,5 × 3,8 × 2,5	6,5 × 5,0 × 2,5
C_R	Ordering code [1]			
	B37979-	B37986-	B37979-	B37986-
10 pF	-K1100-J51		-D1100-J51	
12 pF	-K1120-J51		-D1120-J51	
15 pF	-K1150-J51		-D1150-J51	
18 pF	-K1180-J51		-D1180-J51	
22 pF	-K1220-J51		-D1220-J51	
27 pF	-K1270-J51		-D1270-J51	
33 pF	-K1330-J51		-D1330-J51	
39 pF	-K1390-J51		-D1390-J51	
47 pF	-K1470-J51		-D1470-J51	
56 pF	-K1560-J51		-D1560-J51	
68 pF	-K1680-J51		-D1680-J51	
82 pF	-K1820-J51		-D1820-J51	
100 pF	-K1101-J51		-D1101-J51	
120 pF	-K1121-J51		-D1121-J51	
150 pF	-K1151-J51		-D1151-J51	
180 pF	-K1181-J51		-D1181-J51	
220 pF	-K1221-J51		-D1221-J51	
270 pF	-K1271-J51		-D1271-J51	
330 pF	-K1331-J51		-D1331-J51	
390 pF	-K1391-J51		-D1391-J51	
470 pF	-K1471-J51		-D1471-J51	
560 pF	-K1561-J51		-D1561-J51	
680 pF	-K1681-J51		-D1681-J51	
820 pF	-K1821-J51		-D1821-J51	
1,0 nF	-K1102-J51		-D1102-J51	

continued on next page ...



Ordering codes for capacitors with radial straight leads, 100 Vdc

Lead spacing	2,5 mm		5,0 mm	
				
$h \times b \times s$ (mm)	5,5 × 3,8 × 2,5	6,5 × 5,0 × 2,5	5,5 × 3,8 × 2,5	6,5 × 5,0 × 2,5
C_R	Ordering code [1]			
	B37979-	B37986-	B37979-	B37986-
1,2 nF		-K1122-J51		-D1122-J51
1,5 nF		-K1152-J51		-D1152-J51
1,8 nF		-K1182-J51		-D1182-J51
2,2 nF		-K1222-J51		-D1222-J51

Characteristics:

Compare with standard chip capacitors.

1) The tables contain the ordering code for capacitors with radial straight leads (CECC standard), V_R = 100 Vdc
– taped, reel packing
– with a capacitance tolerance of ± 5 %
For other versions refer to “Delivery Modes and Ordering Code”, page 115.

Features

- High volumetric efficiency
- Non-linear capacitance change
- High insulation resistance
- High pulse strength

Applications

- Blocking
- Coupling
- Decoupling
- Interference suppression

Terminals

- Parallel wire leads
  iron-nickel, tinned
- Straight leads
- Non-standard lead lengths on request

Marking

Rated capacitance, tolerance, manufacturer's logo, ceramic material, voltage

Packing

Optionally

- Taped (reel or Ammo pack)
- Bulk

Maximum ratings

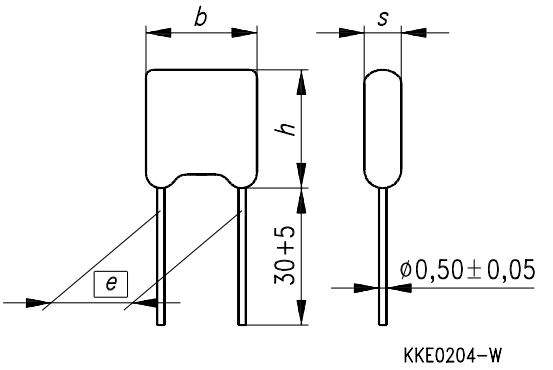
- Climatic category
  in accordance with IEC 68-1: 55/125/56

Available capacitance tolerances

Tolerance	Symbol
$\Delta C_R/C_R = \pm$ **10 %**	**K** [1]
$\Delta C_R/C_R = \pm$ 20 %	M

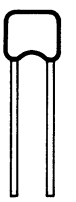
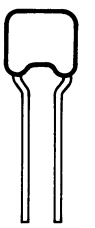
Rated voltage values

V_R = 50 V [2]

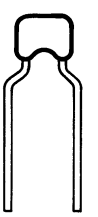
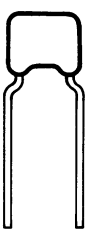
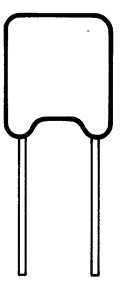


Dimensions (mm)

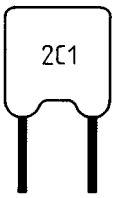
Lead spacing e = 2,5 $^{+0,6}_{-0,1}$ mm

h_{max}	5,5	6,5
b_{max}	3,8	5,0
s_{max}	2,5	2,5
		
Type	B37981-K	B37987-K

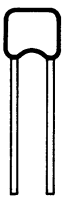
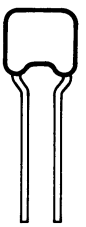
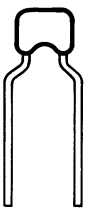
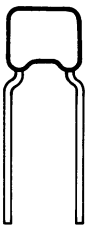
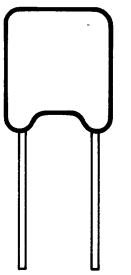
Lead spacing e = 5,0 $^{+0,6}_{-0,1}$ mm

h_{max}	5,5	6,5	9,0
b_{max}	3,8	5,0	7,5
s_{max}	2,5	2,5	2,5
			
Type	B37981-D	B37987-D	B37984-K

1) Standard tolerance
2) Also suitable for 63 V applications.



Ordering codes for capacitors with radial straight leads, 50 Vdc

Lead spacing	2,5 mm		5,0 mm		
					
$h \times b \times s$ (mm)	5,5 × 3,8 × 2,5	6,5 × 5,0 × 2,5	5,5 × 3,8 × 2,5	6,5 × 5,0 × 2,5	9,0 × 7,5 × 2,5
C_R	Ordering code [1]				
	B37981-	B37987-	B37981-	B37987-	B37984-
3,3 nF	-K5332-K51		-D5332-K51		
3,9 nF	-K5392-K51		-D5392-K51		
4,7 nF	-K5472-K51		-D5472-K51		
5,6 nF	-K5562-K51		-D5562-K51		
6,8 nF	-K5682-K51		-D5682-K51		
8,2 nF	-K5822-K51		-D5822-K51		
10 nF	-K5103-K51		-D5103-K51		
12 nF	-K5123-K51		-D5123-K51		
15 nF	-K5153-K51		-D5153-K51		
18 nF	-K5183-K51		-D5183-K51		
22 nF	-K5223-K51		-D5223-K51		
27 nF	-K5273-K51		-D5273-K51		
33 nF	-K5333-K51		-D5333-K51		
39 nF	-K5393-K51		-D5393-K51		
47 nF	-K5473-K51		-D5473-K51		
56 nF		-K5563-K51		-D5563-K51	
68 nF		-K5683-K51		-D5683-K51	
82 nF		-K5823-K51		-D5823-K51	
100 nF		-K5104-K51		-D5104-K51	
120 nF		-K5124-K51		-D5124-K51	
150 nF		-K5154-K51		-D5154-K51	
180 nF		-K5184-K51		-D5184-K51	
220 nF		-K5224-K51		-D5224-K51	
270 nF					-K5274-K51
330 nF					-K5334-K51
390 nF					-K5394-K51
470 nF					-K5474-K51
560 nF					-K5564-K51

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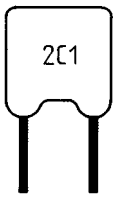
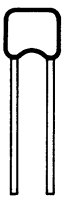
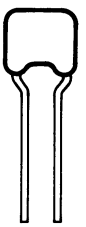
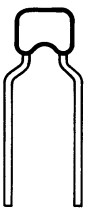
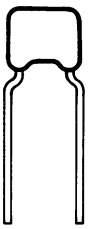
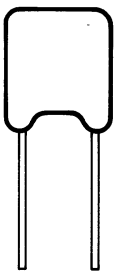


Ordering codes for capacitors with radial straight leads, 50 Vdc

Lead spacing	2,5 mm		5,0 mm		
					
$h \times b \times s$ (mm)	5,5 × 3,8 × 2,5	6,5 × 5,0 × 2,5	5,5 × 3,8 × 2,5	6,5 × 5,0 × 2,5	9,0 × 7,5 × 2,5
C_R	Ordering code [1]				
	B37981-	B37987-	B37981-	B37987-	B37984-
680 nF					-K5684-K51
820 nF					-K5824-K51
1,0 µF					-K5105-K51

1) The tables contain the ordering code for capacitors with radial straight leads (CECC standard), V_R = 50 Vdc
– taped, reel packing
– with a capacitance tolerance of ± 10 %
For other versions refer to “Delivery Modes and Ordering Code”, page 115.

Features

- Extremely high volumetric efficiency
- Non-linear capacitance change

Applications

- Blocking
- Coupling
- Decoupling
- Interference suppression

Terminals

- Parallel wire leads
  iron-nickel, tinned
- Straight leads
- Non-standard lead lengths on request

Marking

- Rated capacitance, tolerance, manufacturer's logo, ceramic material, voltage

Packing

Optionally

- Taped (reel or Ammo pack)
- Bulk

Maximum ratings

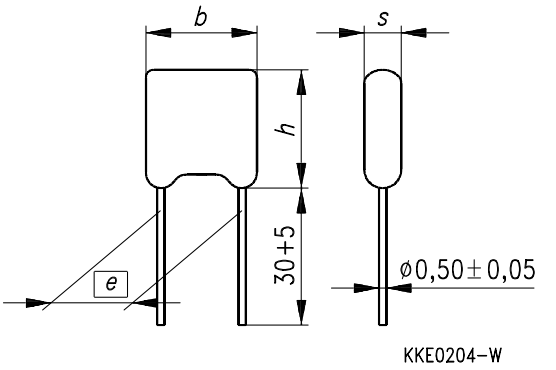
- Climatic category
  in accordance with IEC 68-1: 25/085/56

Available capacitance tolerances

$\Delta C_R/C_R = \pm 20$ %, Symbol: M

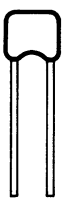
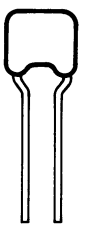
Rated voltage values

$V_R = 50$ V [1)]

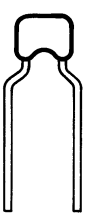
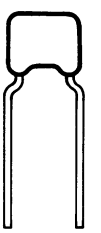
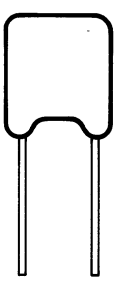


Dimensions (mm)

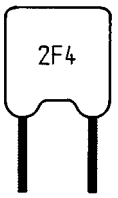
Lead spacing e = 2,5 $^{+0,6}_{-0,1}$ mm

h_{max}	5,5	6,5
b_{max}	3,8	5,0
s_{max}	2,5	2,5
		
Type	B37982-K	B37988-K

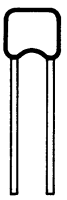
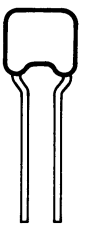
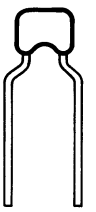
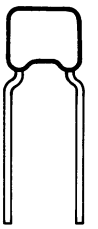
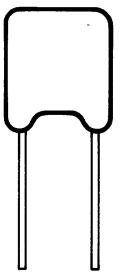
Lead spacing e = 5,0 $^{+0,6}_{-0,1}$ mm

h_{max}	5,5	6,5	9,0
b_{max}	3,8	5,0	7,5
s_{max}	2,5	2,5	2,5
			
Type	B37982-D	B37988-D	B37985-K

1) Also suitable for 63 V applications.



Ordering codes for capacitors with radial straight leads, 50 Vdc

Lead spacing	2,5 mm		5,0 mm		
					
$h \times b \times s$ (mm)	5,5 × 3,8 × 2,5	6,5 × 5,0 × 2,5	5,5 × 3,8 × 2,5	6,5 × 5,0 × 2,5	9,0 × 7,5 × 2,5
C_R	Ordering code [1]				
	B37982-	B37988-	B37982-	B37988-	B37985-
10 nF	-K5103-M51		-D5103-M51		
15 nF	-K5153-M51		-D5153-M51		
22 nF	-K5223-M51		-D5223-M51		
33 nF	-K5333-M51		-D5333-M51		
47 nF	-K5473-M51		-D5473-M51		
68 nF	-K5683-M51		-D5683-M51		
100 nF	-K5104-M51		-D5104-M51		
150 nF	-K5154-M51		-D5154-M51		
220 nF		-K5224-M51		-D5224-M51	
330 nF		-K5334-M51		-D5334-M51	
470 nF		-K5474-M51		-D5474-M51	
680 nF		-K5684-M51		-D5684-M51	
1,0 µF		-K5105-M51		-D5105-M51	
1,5 µF					-K5155-M51
2,2 µF					-K5225-M51
3,3 µF					-K5335-M51
4,7 µF					-K5475-M51

Characteristics:

Compare with standard chip capacitors (Z5U).

1) The tables contain the ordering code for capacitors with radial straight leads (CECC standard)
– taped, reel packing
– with a capacitance tolerance of ± 20 %
For other versions refer to “Delivery Modes and Ordering Code”, page 115.

1 Definition and construction

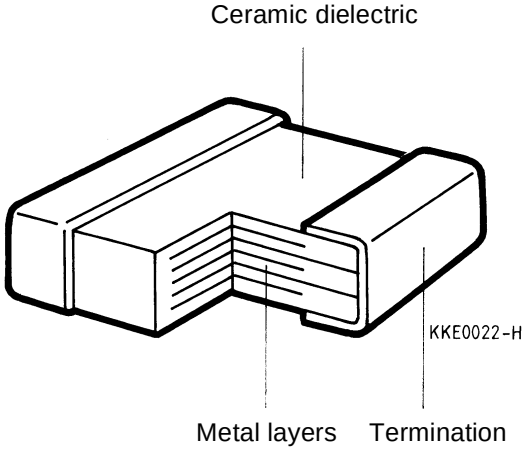
1.1 Introduction

The term ceramic capacitors covers a large group of capacitors. Their properties may be quite different, but they all have the oxide ceramic dielectric in common.

Ceramic generally means that an inorganic polycrystalline body is formed by sintering at high temperatures. By means of special production methods, extremely thin layers of ceramic materials can be obtained. These layers are stacked to construct capacitors whose electrical and mechanical properties meet stringent requirements.

The multilayer capacitors consist of a monolithic ceramic block with comb-like sintered electrodes. These electrodes come to the surface at the face ends of the ceramic block where an electrical contact is made by burnt-in metallic layers.

Schematic construction of a multilayer capacitor:



$$C = \frac{\varepsilon_0 \cdot \varepsilon_r \cdot (n-1) \cdot A}{d}$$

C: Capacitance of capacitor [As/V = F]
$\varepsilon_0 \approx 8{,}85 \cdot 10^{-12}$ As/Vm: absolute dielectric constant
ε_r: relative dielectric constant (material dependent)
A: effective electrode area per electrode [m^2]
n: number of electrodes (metal layers)
d: electrode spacing [m]

1.2 Type classification and application

Depending on the chemical composition of their ceramic dielectrics, which determine the main electric properties, ceramic capacitors are classified as follows:

Class-1 capacitors

- The dielectric ($\varepsilon < 500$) primarily consists of a mixture of metal oxides and titanates.
- Defined linear temperature coefficient with reversible temperature dependence
- Capacitance does not vary with voltage.
- Low losses at frequencies up to the UHF range
- High insulation resistance

Applications: resonant circuits, filters, timing elements

Class-2 capacitors

- The dielectric ($\varepsilon \approx 1000$ to 10000) primarily consists of titanates (barium, calcium, strontium) and zirconates.
- Non-linear dependence of capacitance on temperature and voltage
- Somewhat higher losses and lower insulation resistance than class-1 capacitors
- Capacitance decreases according to a logarithmic function (ageing).
- Relatively high capacitance values even with small-size capacitors

Applications: coupling, blocking, filtering.

2 Temperature characteristics of capacitance for class-1 ceramics

In accordance with EIA-198-D

C 0 G

Tolerance in ppm/°C

G = ± 30 L = ± 500
H = ± 60 M = ± 1000
J = ± 120 N = ± 2500
K = ± 250

Multiplier (multiplication by significant digits gives α in ppm/°C)

0 = – 1 5 = + 1
1 = – 10 6 = + 10
2 = – 100 7 = + 100
3 = – 1000 8 = + 1000

Significant digits of temperature coefficient α

C = 0,0 S = 3,3
M = 1,0 T = 4,7
P = 1,5 U = 7,5
R = 2,2

In accordance with CECC standard 32100 / IEC standard 384-8

Rated temperature coefficient α (10^{-6}/°C)	Limit deviations for temperature coefficient (10^{-6}/°C)	Class	Code letters for	
			α	Limit deviations
+ 100	± 30	1B	A	G
0	± 30	1B	C	G
– 33	± 30	1B	H	G
– 75	± 30	1B	L	G
– 150	± 30	1B	P	G
– 220	± 30	1B	R	G
– 330	± 60	1B	S	H
– 470	± 60	1B	T	H
– 750	± 120	1B	U	J
– 1000	± 250	1F	Q	K
– 1500	± 250	1F	V	K
– 1000 ≤ α ≤ + 140		1C	SL	–
– 1750 ≤ α ≤ + 250		1D	UM	–

Notes:

- The rated values of the temperature coefficient α and the accompanying limit deviations are defined using the capacitance change between the temperatures 20 °C and 85 °C.
- A capacitor having a temperature coefficient of zero and a limit deviation of $\pm 30 \cdot 10^{-6}$/°C is given the code letters CG (class 1B).

3 Temperature characteristics of capacitance for class-2 ceramics

In accordance with EIA-198-D

X 7 R

Maximum deviation of capacitance values
in %, referred to 25 °C

A = ± 1,0	E = ± 4,7	S = ± 22,0
B = ± 1,5	F = ± 7,5	T = + 22/– 33
C = ± 2,2	P = ± 10,0	U = + 22/– 56
D = ± 3,3	R = ± 15,0	V = + 22/– 82

Upper category temperature

4 = + 65 °C
5 = + 85 °C
6 = + 105 °C
7 = + 125 °C

Lower category temperature

Z = + 10 °C
Y = – 30 °C
X = – 55 °C

In accordance with CECC standard 32100 / IEC standard 384-10

Code letter for sub-class	Max. capacitance change in % over specified temperature range		Symbol for specified temperature range (°C)				
			– 55/+ 125	– 55/+ 85	– 40/+ 85	– 25/+ 85	+ 10/+ 85
	without dc voltage	with dc voltage	1	2	3	4	6
2B	± 10 %	+ 10/– 15 %	–	×	×	×	–
2C	± 20 %	+ 20/– 30 %	×	×	×	–	–
2D	+ 20/– 30 %	+ 20/– 40 %	–	–	–	×	–
2E	+ 22/– 56 %	+ 22/– 70 %	–	×	×	×	×
2F	+ 30/– 80 %	+ 30/– 90 %	–	×	×	×	×
2R	± 15 %		×	–	–	–	–
2X	± 15 %	+ 15/– 25 %	×	–	–	–	–

4 Important terms

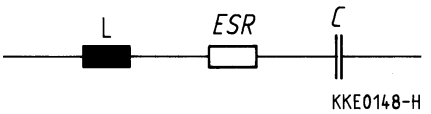
4.1 Capacitance

The unit of capacitance is the farad. One farad is the capacitance of a capacitor in which a charge of one coulumb produces one volt potential difference between the terminals.

$$C = \frac{Q_{el}}{V}$$

Q_{el}: charge stored in the capacitor [C = As]
V: voltage applied to the capacitor [V]

Practical equivalent circuit diagram for a real capacitor



L: inductance [H = Vs/A]
C: capacitance [F = As/V]
ESR: equivalent series resistance [Ω]

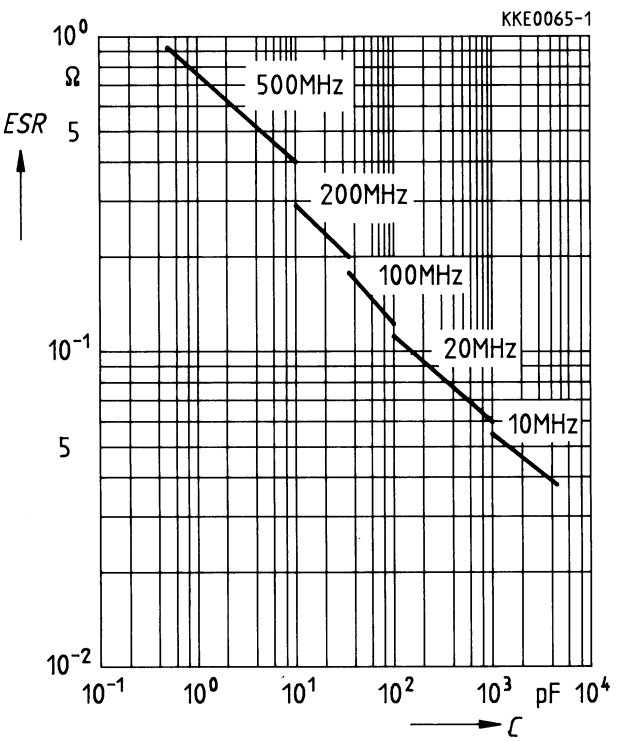
The magnitude of the impedance for this configuration can be calculated as follows:

$$|Z| = \sqrt{ESR^2 + (1/(2\pi fC) - 2\pi fL)^2}$$

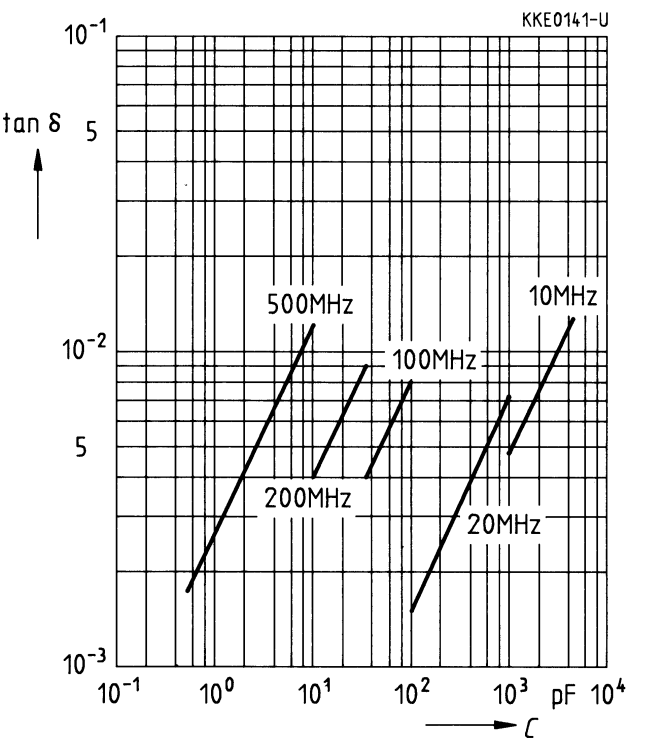
Z: impedance (ac resistance) [Ω]
f: frequency of applied voltage [Hz]

4.2 Frequency response

Equivalent series resistance versus capacitance for C0G capacitors



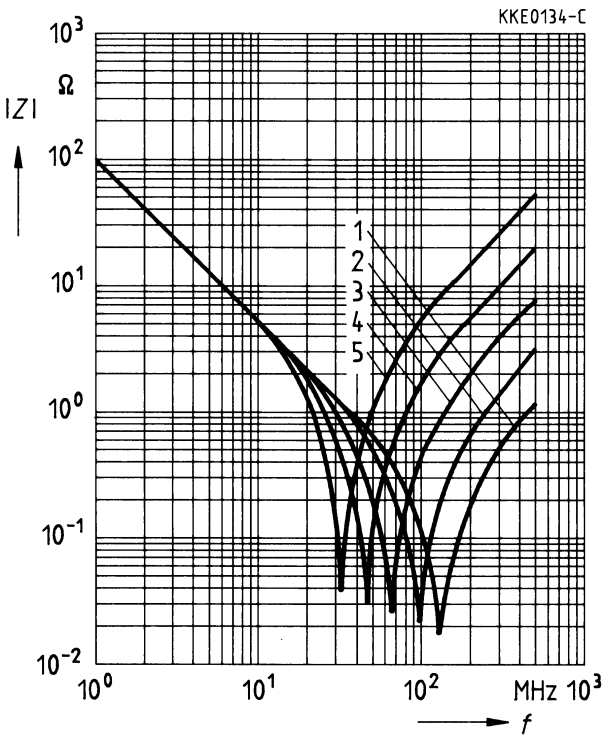
Dissipation factor versus capacitance for C0G capacitors



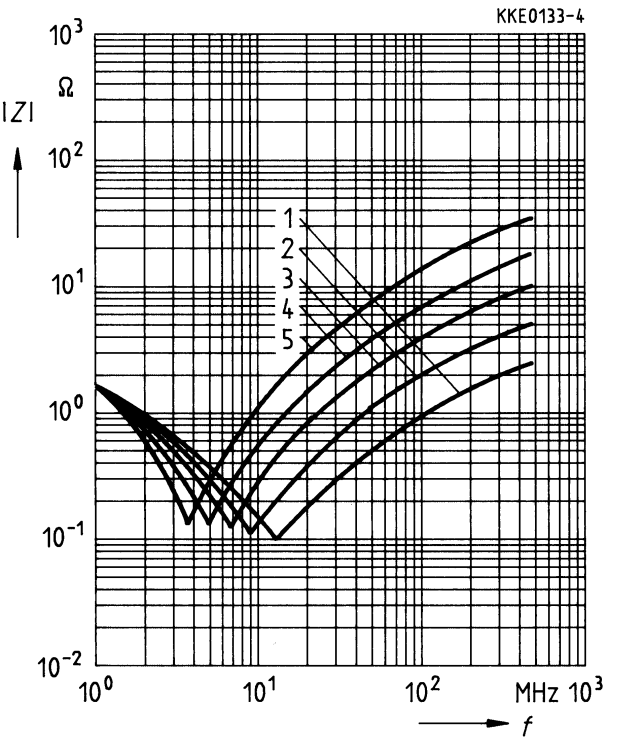
The type-related impedance characteristics of chip capacitors are to be found in the data sheet section (pages 27 to 54).

The relationship between capacitance of capacitors with wire leads and frequency is also affected by the lead lengths and mounting conditions.
The graphs below show a comparison between chip capacitors and leaded capacitors, providing an idea of the typical frequency response of leaded ceramic capacitors.

Example: C0G capacitor, C_R = 1 nF

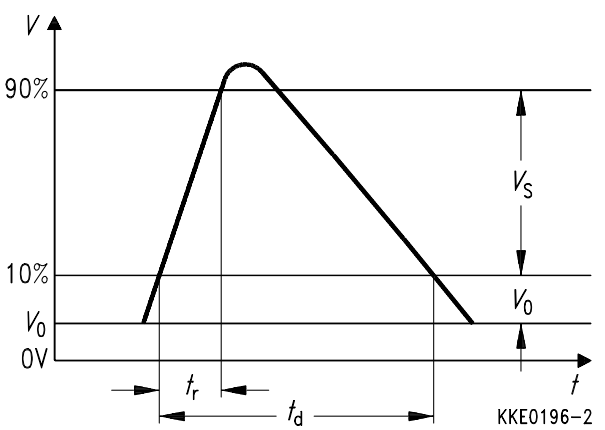


Example: X7R capacitor, C_R = 100 nF



1: Chip
2: 1,5 mm lead length
3: 5,0 mm lead length
4: 10,0 mm lead length
5: 20,0 mm lead length

4.3 Pulse handling capability



Pulse definition in accordance with DIN 40 839
Rate of voltage rise: $S_V = 0{,}8 \cdot V_S / t_r$
Max. permissible rate S_V = 1000 V/µs
Max. voltage amplitude: $V_S + V_0 = 2{,}5 \cdot V_R$

4.4 Thermal characteristic and electrical ratings

Ceramic capacitors change their capacitance more (class 2) or less (class 1) with temperature. Graphs in the data sheet section show the respective characteristic curves.

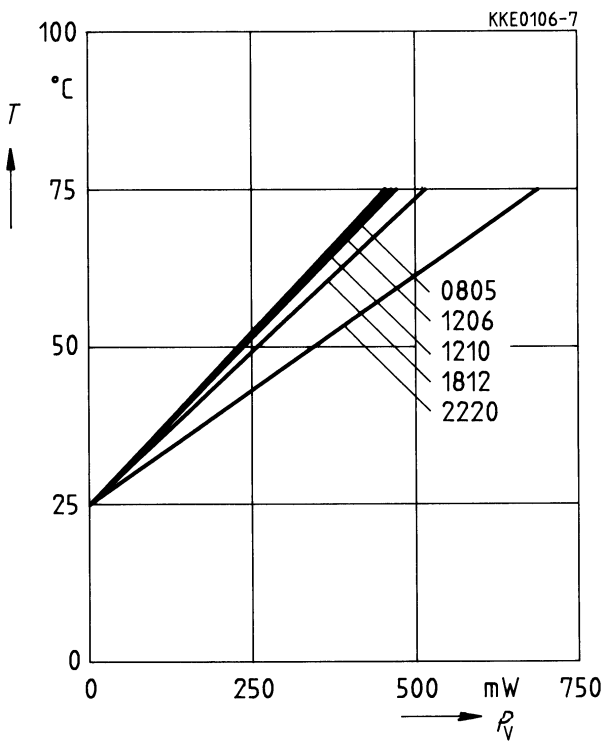
Basically, ceramic multilayer capacitors may also be operated at higher temperatures than specified by the upper category temperature. But in such cases some specific features of the ceramic material systems must be taken into account.

Due to a change in the crystalline structure, the capacitance value of high K materials (with a high dielectric constant, e.g. X7R, Z5U) drastically decreases above the Curie point (order of magnitude approximately 50 % at 150 °C). With low K materials (with a low dielectric constant, e.g. C0G) the dissipation factor increases considerably at high temperatures (order of magnitude approximately 300 to 500 % at 150 °C).

Owing to the high temperature, moreover, an acceleration of failure mechanisms and thus a shorter service life of the capacitor is to be expected. As the activation energy, necessary for calculating the service life, is subject to some uncertainty, the numerical estimation may be incorrect. In the most favorable case (E_a = 0,5 eV) it can be assumed that the failure rate at 150 °C is approximately 125 times higher than under standard conditions T = 40 °C.

In addition to the high ambient temperature, the high electrical energy exchange contributes to heating the capacitor.

Heating of capacitors as a function of power dissipation
(Parameter: size)



4.5 Ageing

The capacitance of class-2 capacitors decreases with time. This process, known as ageing , follows a logarithmic law, which is expressed in terms of an ageing constant. The ageing constant is defined as the percentage loss of capacitance during a “time decade”, i.e. during a period of time, in which the capacitor is subject to a tenfold increase in age (e.g. from 1 h to 10 h).

The law of capacitance ageing is expressed by the following equation:

$C_t = C_1 \cdot (1 - k \cdot \log_{10} t)$

C_t: capacitance, t hours after start of ageing [F]
C_1: capacitance, 1 hour after start of ageing [F]
k: ageing constant (capacitance decrease per decade)
t: time in hours from start of ageing [h]

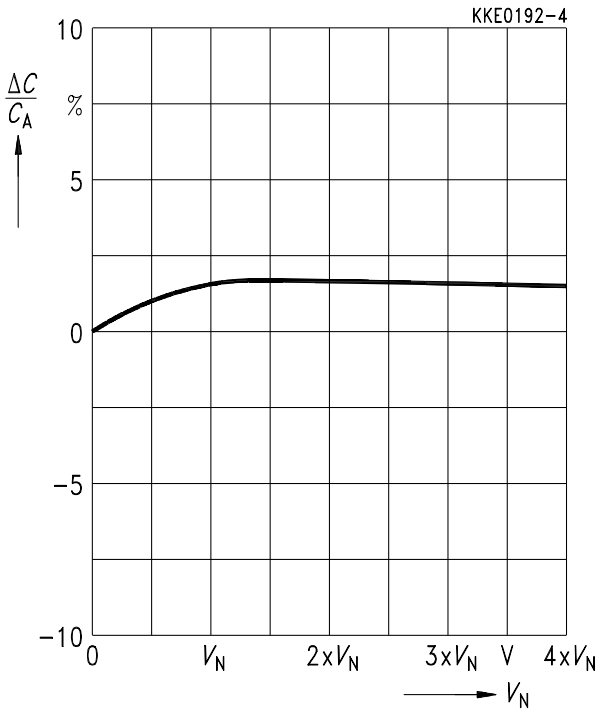
Because of ageing, it is necessary to specify an age for reference measurements at which the capacitance shall be within the prescribed tolerances. Since the capacitance significantly decreases during the first hours after production, all capacitors shipped are guaranteed a capacitance value for 1000 hours (t = 1000 h). By heating the capacitors above the Curie temperature (approximately 130 – 150 °C) the capacitance decrease can be reversed. Ageing then starts anew.

Surface-mount devices will be completely de-aged by each soldering process; subsequently a new ageing process begins.

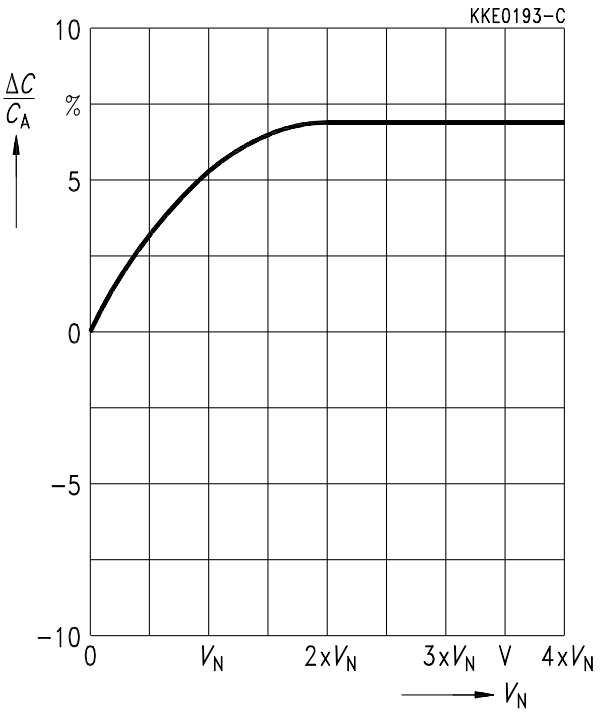
4.6 Influence of measuring conditions and preconditioning

High dc voltages applied to class-2 capacitors also result in capacitance changes (depending on the material system used):

Capacitance change after
dc voltage appplied to
X7R and 2C1 capacitors (typical values)



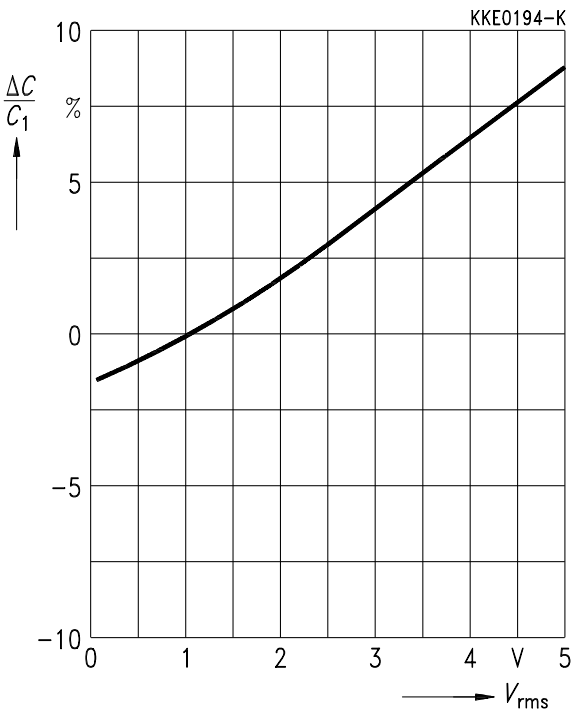
Capacitance change after
dc voltage appplied to
Z5U capacitors (typical values)



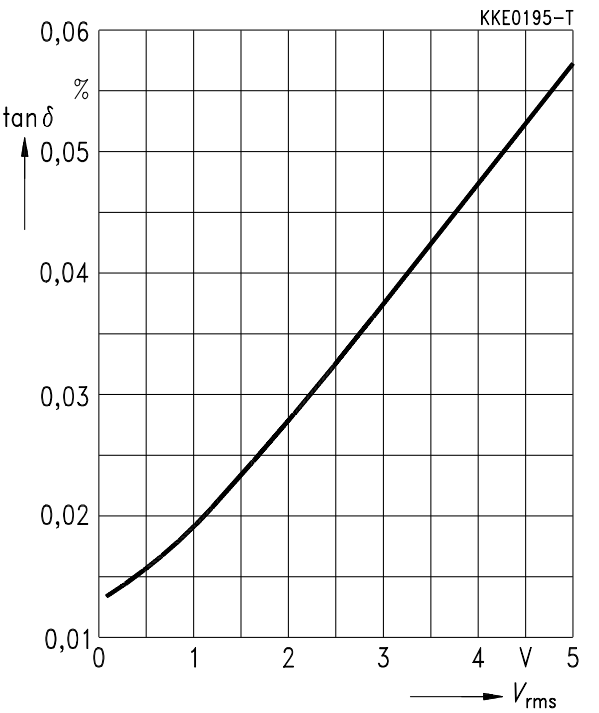
These voltage effects can only be reversed by de-ageing. The capacitance of class-2 capacitors changes with voltage and/or temperature load. If measurements are made immediately after a voltage test, an insulation test or a test under thermal stress, the capacitance may be exceeded.

The following curves show the effects of deviations from the standard measurement conditions (V_{rms}, f_{meas}, T_{meas} according to measuring and test conditions, page 97), taking an X7R capacitor as an example.

Capacitance change $\Delta C/C_1$ versus measuring ac voltage V_{rms}



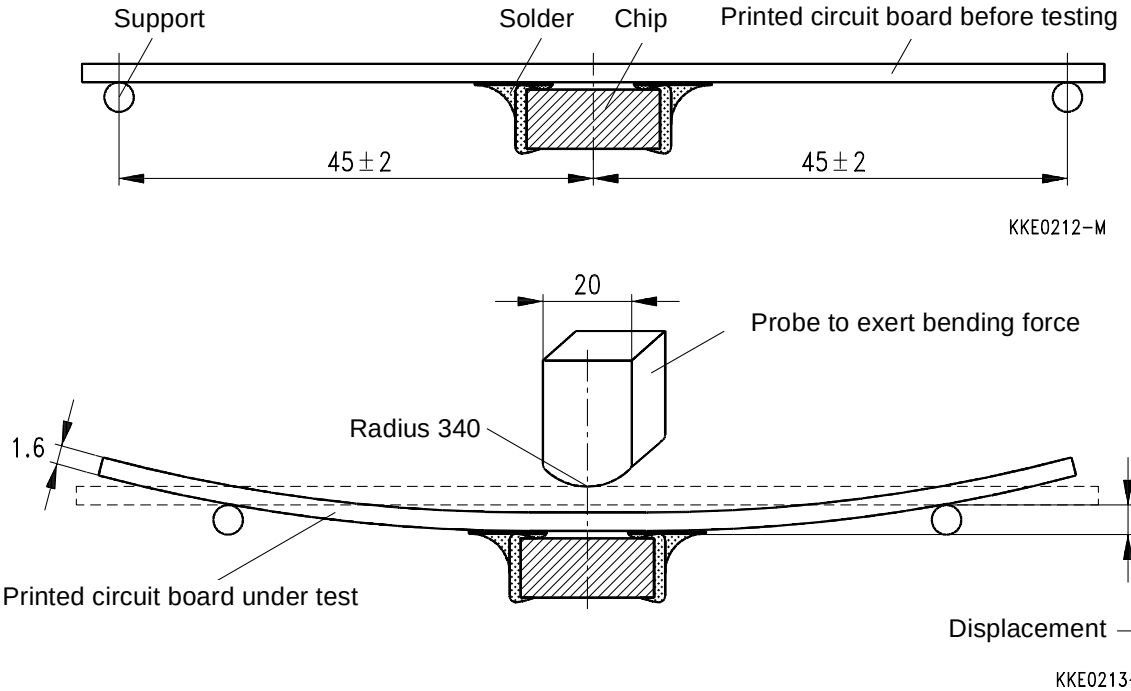
Dissipation factor tan δ versus measuring ac voltage V_{rms}



4.7 Effect of mechanical stress

In practical applications, two types of mechanical stress play the main roles: forces exerted during component mounting and forces that result when the printed circuit boards are subjected to bending strain.

a) Bending strength



Units: mm

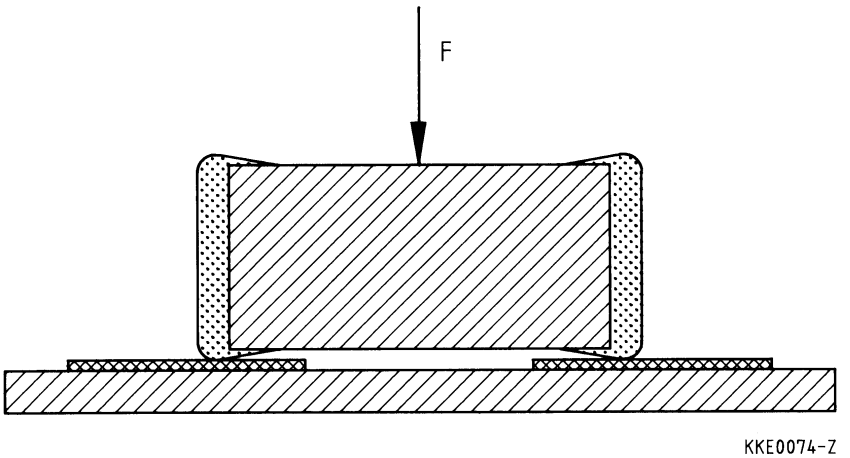
Size	Thickness	Class 1	Class 2
0603	0,8		
0805	0,6		
	0,8		
1206	0,6		
	0,8		
1210	0,6		
	0,8		
1812	1,2		
2220	1,2		

0 1 2 3 4 5 6/0 1 2 3 4 5 6

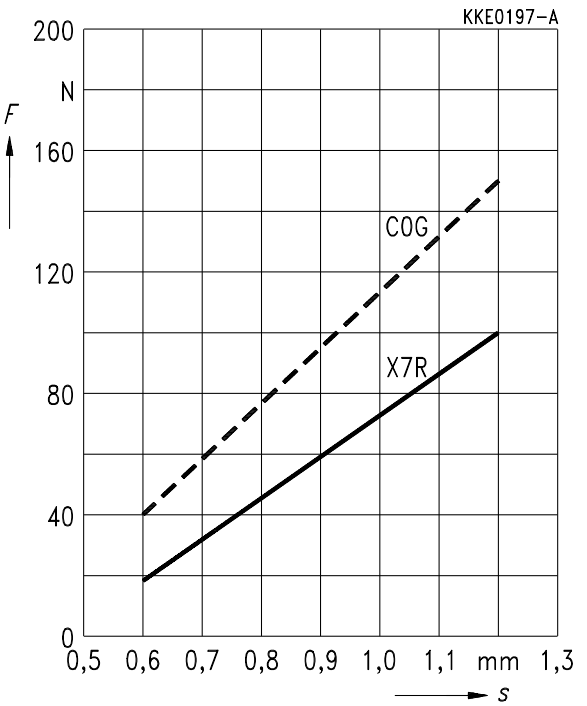
Displacement due to bending

Failure criterion:
$\Delta C/C_0 \geq 5\%$ for C0G
$\Delta C/C_0 \geq 10\%$ for X7R
or visible damage

b) Breaking strength



Breaking strength *F* versus chip thickness *s*



c) Mechanical robustness of leads

Leads may not be bent within a length of 1 mm from the point where they leave the capacitor body.
Bending conditions specified by IEC 68-2-21:
Tensile strength: 10 N
Bending strength: 2 bending cycles through 90° with a force of 5 N

5 Climatic categories

The test class or climatic category in accordance with IEC 68-1 is indicated by 3 groups of figures, e.g.: 55/125/56

1st group of figures:
corresponds to lower category temperature (test for resistance to cold)

2nd group of figures:
corresponds to upper category temperature (test for resistance to dry heat)

3rd group of figures:
number of days denoting duration of damp heat test at 93 % relative humidity and 40 °C

Storage of chip capacitors

Solderability is guaranteed for one year from date of delivery, provided that the components are stored in the original packages.

Storage temperature: – 25 … + 45 °C
Relative humidity: ≤ 75 % annual average, ≤ 95 % on 30 days in a year

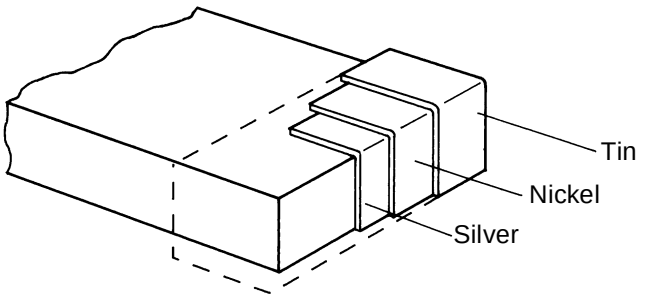
6 Standards and specifications

CECC 00 802	Guideline: CECC standard method for the specification of surface-mount devices (SMDs) of assessed quality
CECC 30 000	Generic specification: fixed capacitors
CECC 30 600	Sectional specification: fixed ceramic capacitors, class 1
CECC 30 700	Sectional specification: fixed capacitors with ceramic dielectrics, class 2
CECC 32 100	Sectional specification: multilayer ceramic chip capacitors
EN 29 000 (ISO 9000)	Quality management and quality assurance standards Guidelines for selection and use
EN 29 001 (ISO 9001)	Quality systems, Model for quality assurance in design/development, production, installation and servicing
EN 29 002 (ISO 9002)	Quality systems Model for quality assurance in production and installation
EN 29 004 (ISO 9004)	Quality management and quality system elements – Guidelines
IEC 63	Standard rated values, E-series (identical to DIN-IEC 63)
IEC 68	Set of standards: electrical engineering; basic environmental testing procedures
IEC 384-1	Fixed capacitors for use in electronic equipment Part 1: Generic specification (identical to DIN IEC 384, Teil 1)

IEC 384-8	Fixed capacitors for use in electronic equipment Part 8: Sectional specification: Fixed capacitors with ceramic dielectric of class 1 (identical to DIN IEC 384, Teil 8)
IEC 384-8-1	Fixed capacitors for use in electronic equipment Part 8-1: Blank detail specification: Fixed capacitors with ceramic dielectric of class 1, quality assessment stage E (identical to DIN IEC 384, Teil 8-1)
IEC 384-9	Fixed capacitors for use in electronic equipment Part 9: Sectional specification: Fixed capacitors with ceramic dielectric of class 2 (identical to DIN IEC 384, Teil 9)
IEC 384-9-1	Fixed capacitors for use in electronic equipment Part 9-1: Blank detail specification: Fixed capacitors with ceramic dielectric of class 2, quality assessment stage E (identical to DIN IEC 384, Teil 9-1)
IEC 384-10	Fixed capacitors for use in electronic equipment Part 10: Sectional specification: Fixed multilayer ceramic chip capacitors (identical to DIN IEC 384, Teil 10)
IEC 384-10-1	Fixed capacitors for use in electronic equipment Part 10-1: Blank detail specification: Fixed multilayer ceramic chip capacitors, quality assessment stage E (identical to DIN IEC 384, Teil 10-1)
DIN 40 080	Sampling plans and procedures for inspection by attributes (identical to IEC 410 and ISO 2859)
DIN 40 839	Electromagnetic compatibility in motor vehicles
EIA-198-D	Ceramic dielectric capacitors Class I, II, III and IV

1 Terminations

1.1 Silver-nickel-tin terminals



As shown in the diagram above, the terminals consist of three metallic layers. A primary silver layer with high conductivity provides for good electrical contact. “Leaching” of the silver is prevented by a nickel barrier layer. The outer tin coating prevents corrosion of the nickel and ensures good component solderability.

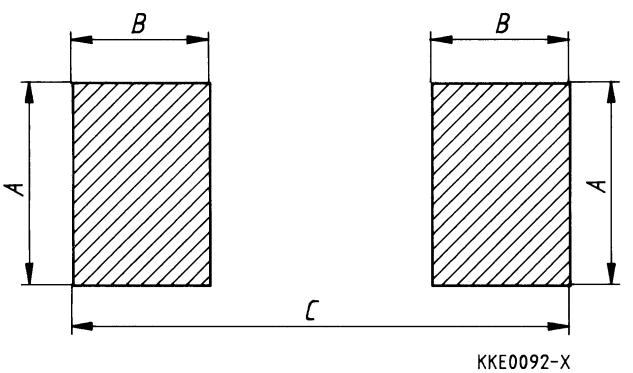
Thickness of layers:

Primary layer	(silver)	> 20 µm
Diffusion barrier	(nickel)	approx. 1 µm
Solder layer	(tin)	3 – 8 µm

1.2 Silver-nickel terminals

We offer two-layer silver-nickel terminals (for layer thickness, cf. 1.1) which are particularly suitable for component connection with conductive adhesives. Soldering is not possible with this kind of terminal.

2 Geometry of solder pads

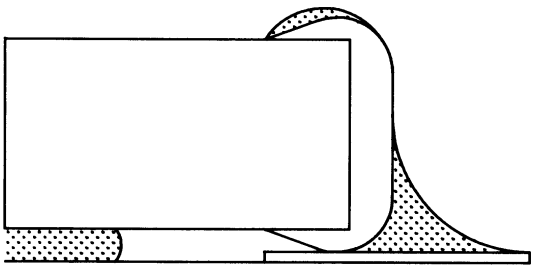


Recommended maximum dimensions (mm)

Size	*A*	*B*	*C*
0402	0,6	0,6	1,7
0603	1,0	1,0	3,0
0805	1,3	1,2	3,4
1206	1,8	1,2	4,5
1210	2,8	1,2	4,5
1812	3,6	1,5	6,0
2220	5,5	1,5	7,2

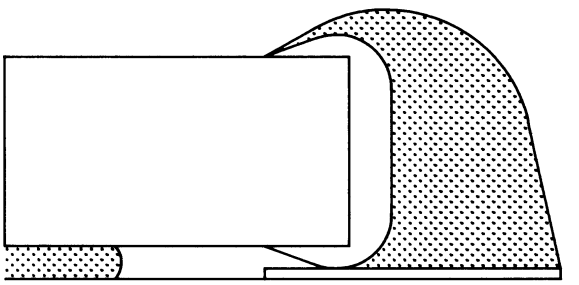
3 Profiles of solder joints

3.1 Wave soldering



KKE0068-Q

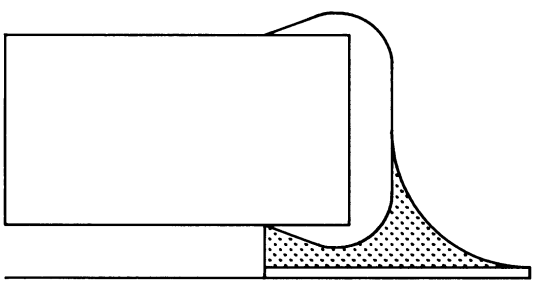
Good solder joint



KKE0069-Y

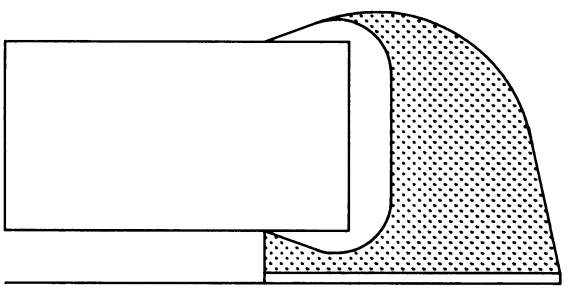
Too much solder
Pad geometry too large, not soldered in preferred direction

3.2 Reflow soldering



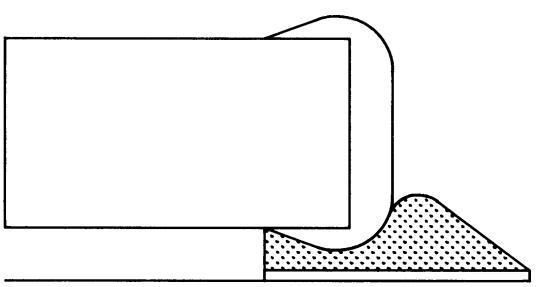
Good solder joint

KKE0070-2



KKE0071-A

Too much solder
Pad geometry too large



Poor wetting

KKE0072-I

4 **Wettability test** in accordance with IEC 68-2-58

Preconditioning: immersion in F-SW 32 flux.
Evaluation criterion: wetting of pads ≥ 95 %.

Terminals	Solder	Bath temperature (°C)	Immersion time (s)
AgNiSn	SnPb 60/40	215 ± 3	3 ± 0,3

5 Solder heat resistance test in accordance with IEC 68-2-58

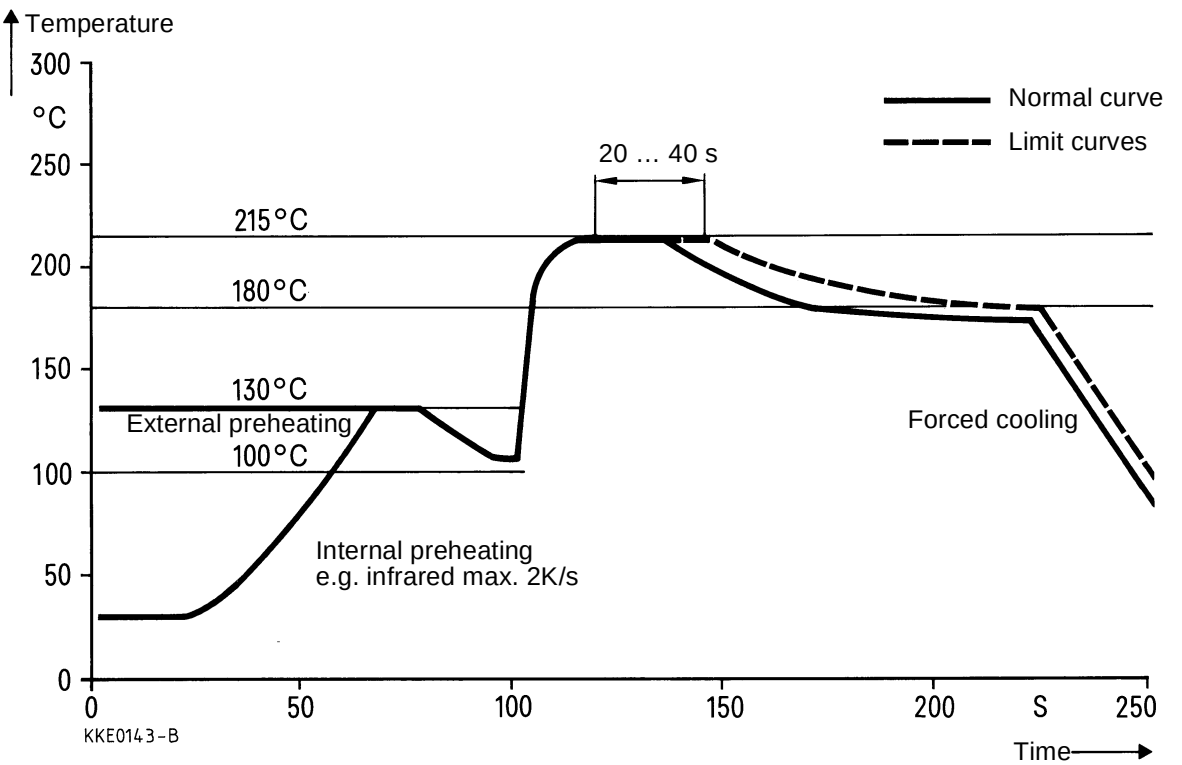
Preconditioning: immersion in F-SW 32 flux.
Evaluation criterion: no leaching of contacts.

Terminals	Solder	Bath temperature (°C)	Immersion time (s)
AgNiSn	SnPb 60/40	260 ± 5	10 ± 1

6 Recommended soldering temperature profiles

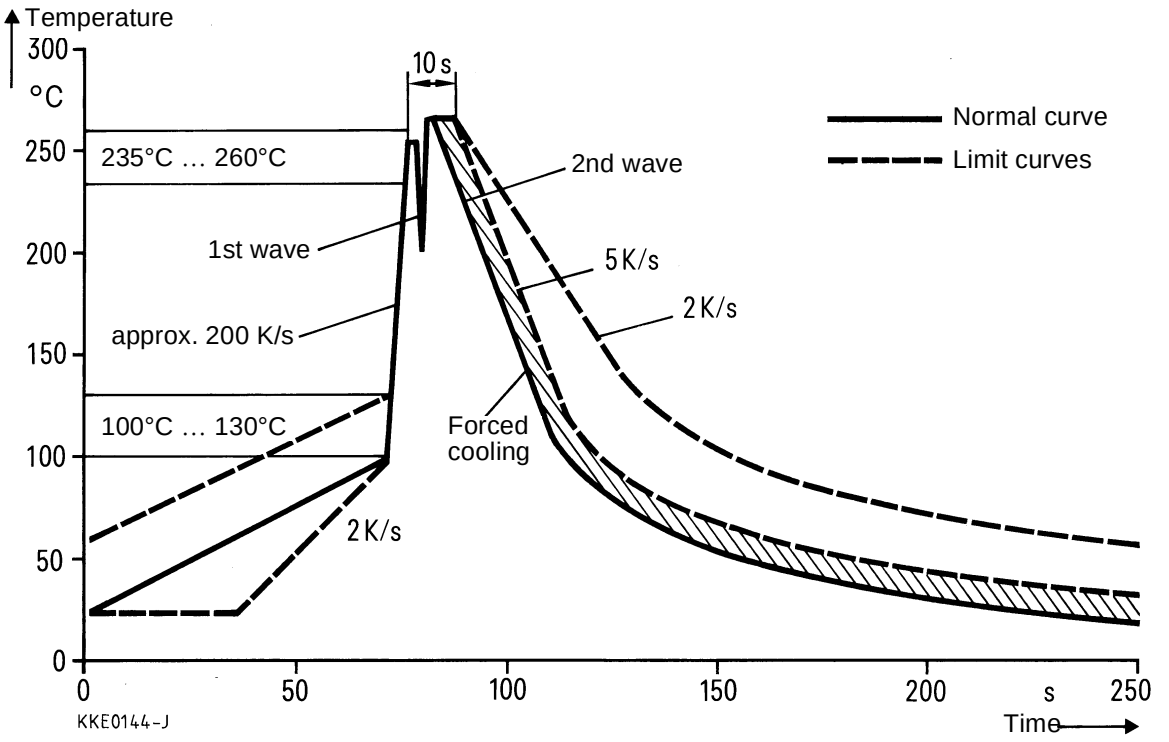
6.1 Vapor-phase soldering

Temperature-time graph of continuous-type vapor-phase soldering with preheating. The temperature at the component terminal applies.



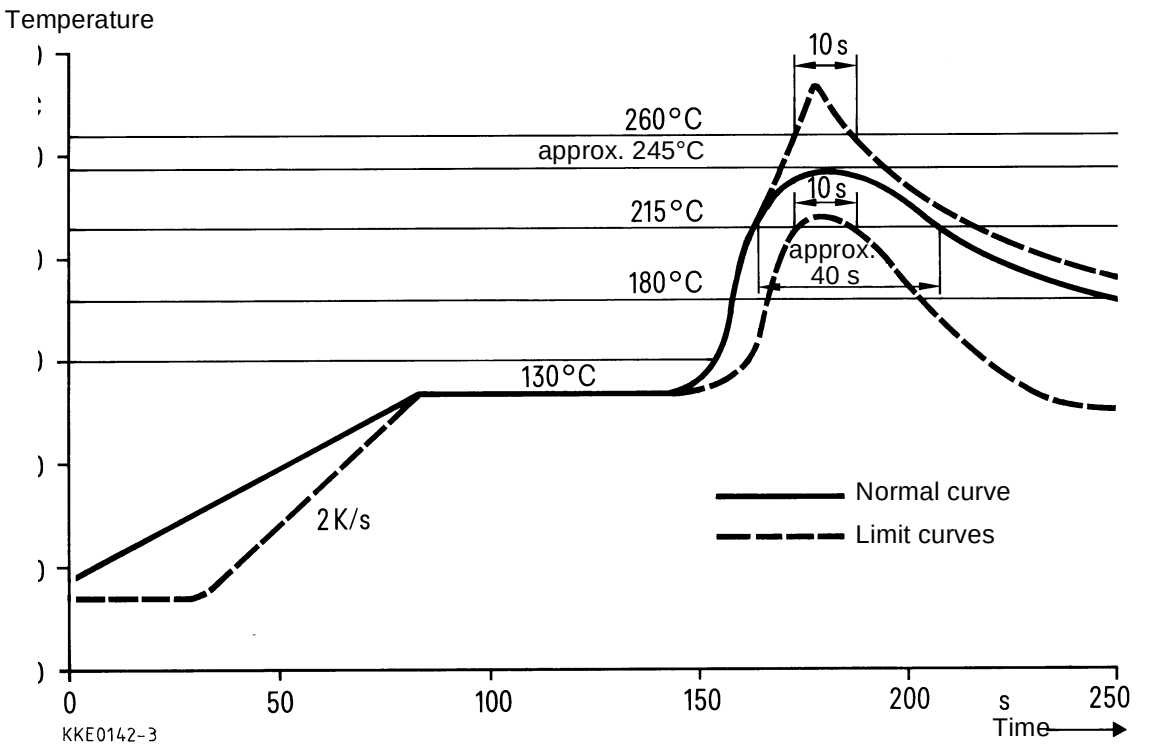
6.2 Wave soldering

Temperature characterictic at component terminal with dual wave soldering



6.3 Infrared-reflow soldering

Temperature characterictic at component terminal with infrared soldering



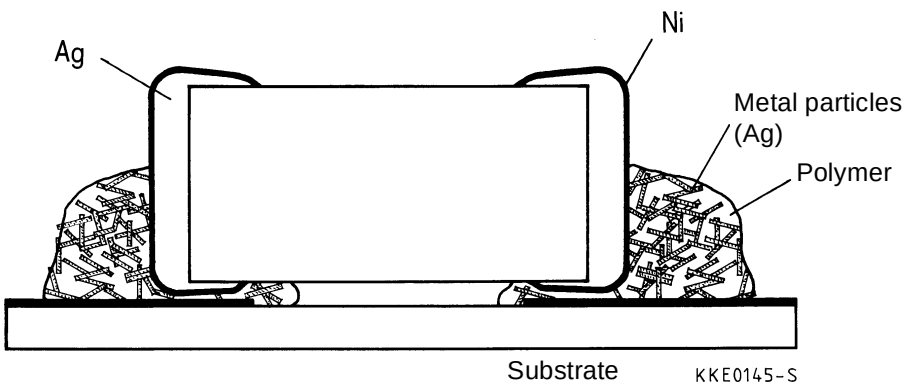
6.4 Notes:

– When larger component sizes (≥ 1210) are used, care should be taken that the temperature difference between preheating and solder wave does not exceed 100 K. Reflow soldering is recommended.
– Manual soldering with a soldering iron is to be avoided, hot-air methods are recommended for making repairs.

7 Conductive adhesion

Attaching surface-mount devices (SMDs) with electrically conductive adhesives is a commercially attractive component connection method to supplement or even replace conventional soldering methods.

Electrically conductive adhesives consist of a non-conductive plastic (epoxy resin, polyimide or silicon) in which electrically conductive metal particles (gold, silver, palladium, nickel etc.) are embedded. Electrical conduction is effected by the metal particles being in contact with each other.



Adhesion is particularly suitable for meeting the demands of hybrid technology. The adhesives can be deposited ready for production requirements by screen printing, stamping or by dispensers. As shown in the following table, conductive adhesion involves two work operations less than soldering.

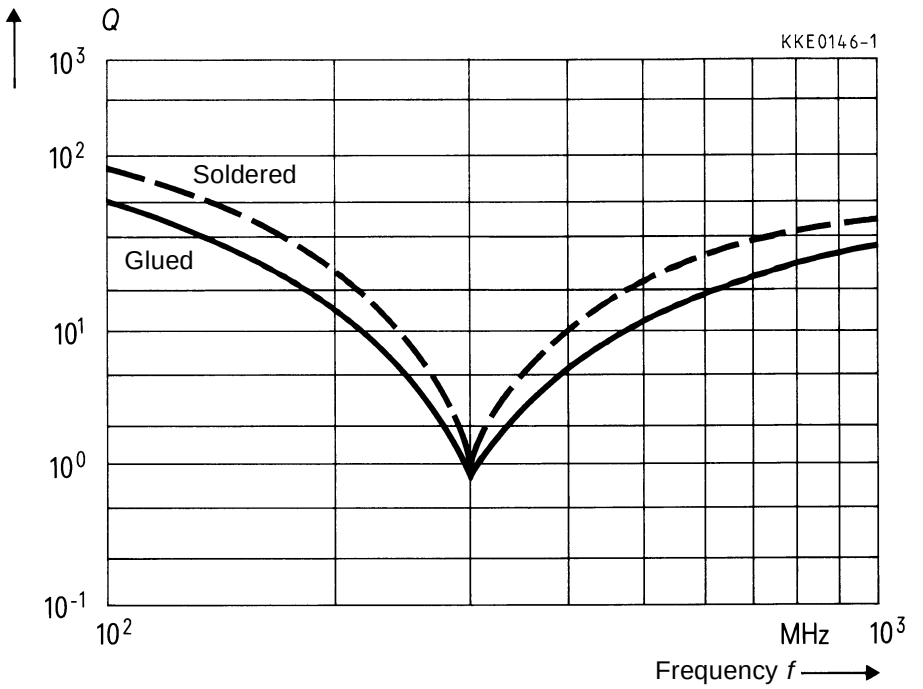
Reflow soldering	Wave soldering	Conductive adhesion
Screen-print solder paste	Apply glue dot	Screen-print conductive adhesive
Mount SMD	Mount SMD	Mount SMD
Predry solder paste	Cure glue	Cure adhesive
Reflow soldering	Wave soldering	Inspect
Wash	Wash	
Inspect	Inspect	

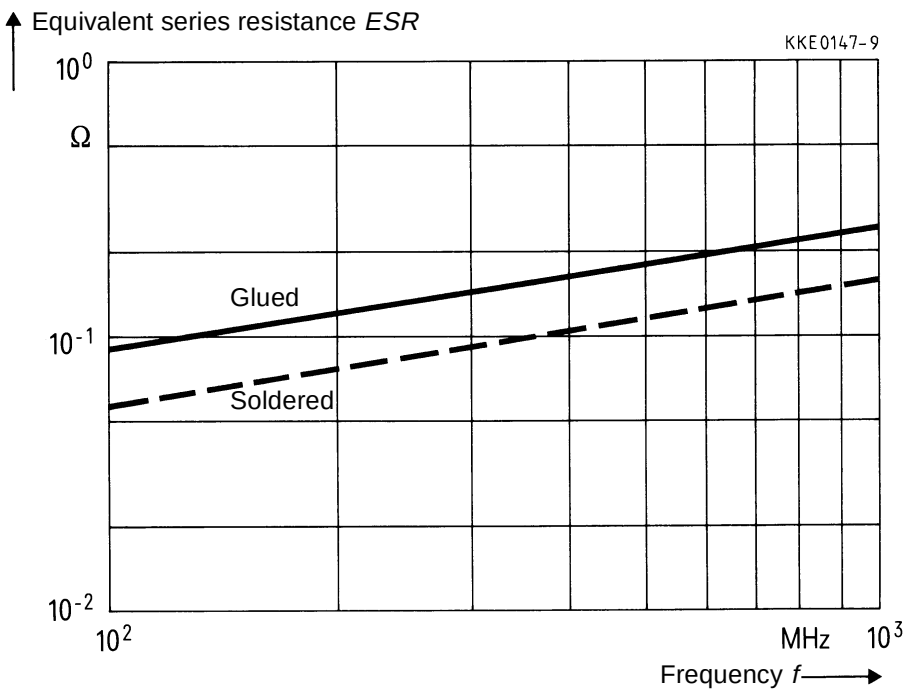
A further advantage of adhesion is that the components are subjected to virtually no temperature shock at all. (The curing temperatures of the adhesives are between120 and 180 °C, typical curing times are between 30 minutes and one hour).

The bending strength of glued chips is, in comparison with that of soldered chips, higher by a factor of at least 2, as is to be expected due to the elasticity of the glued joints.

The electrical characteristics at 1 kHz (for C0G, $C_R \leq 1000$ pF) meet the limiting values specified for each particular ceramic material. As the conductivity of adhesives is lower than that of soft solder, the use of this method for RF applications is restricted.

Comparison (soldered-glued) of quality factor *Q* and equivalent series resistance *ESR* for a C0G capacitor, size 0805 with a capacitance of 220 pF:





8 Notes on cleaning

All environmentally compatible agents are suitable for cleaning. Ultrasonic cleaning should be carried out with the utmost caution. Too high ultrasonic power can impair the adhesive strength of the metallized surfaces.

S+M COMPONENTS **Siemens Matsushita Components**

SMDs from stock

Focus on surface mounting

SCS also offers you an extensive range of components for surface mounting. For example you can have HF chokes SIMID 01 through SIMID 04, thermistor chips for temperature compensation, tantalum chips in sizes A, B, C and D plus surface-mount transformers and laboratory assortments of ceramic chip capacitors.

Ask for our SMD product survey!

SCS – dependable, fast and competent

Measuring and Test Conditions

1 Capacitance measurements

Measuring conditions in accordance with CECC 30 000 (IEC 384-1)

Measuring frequency f_{meas}	1 MHz ± 0,2 MHz for capacitances ≤ 1000 pF (class 1 only) 1 kHz ± 0,2 kHz for capacitances > 1000 pF and for all class 2 capacitors
Measuring voltage V_{rms}	1 Vac ± 0,2 V for C0G, CG, 2C1, X7R, 2R1 0,3 Vac ± 0,1 V for Z5U (Y5U), 2F4
Reference temperature T_{ref}	25 °C ± 1 K (for EIA temperature characteristics) 20 °C ± 1 K (for CECC temperature characteristics)

2 Dissipation factor measurements

The measuring conditions for the dissipation factor are the same as for the capacitance.

3 Insulation resistance measurements

Measuring conditions in accordance with CECC 30 000 (IEC 384-1)

The measuring voltage is equal to the rated voltage. The charging current may not exceed 50 mA, the charging period is 1 minute.

For capacitance values exceeding 10 nF the time constant $\tau = C \cdot R_{ins}$ is indicated.

4 Voltage tests

Test conditions in accordance with CECC 30 000 (IEC 384-1)

Test voltage: 2,5 · rated voltage.

The charging current may not exceed 50 mA. Duration of test: 5 seconds.

5 Tests for resistance to soldering heat

Chip capacitors:
Test conditions in accordance with IEC 68-2-58

Capacitance change

C0G, CG	≤ 1 % or 0,5 pF (whichever is greater)
X7R, 2 R1, 2C1	≤ – 5/+ 10 %
Z5U (Y5U), 2F4	≤ + 20 %

Capacitors with radial leads:
Test conditions in accordance with IEC 68-2-20

Capacitance change

C0G, CG	≤ 1 % or 0,5 pF (whichever is greater)
X7R, 2R1, 2C1	≤ – 5/+ 10 %
Z5U (Y5U), 2F4	≤ + 20 %

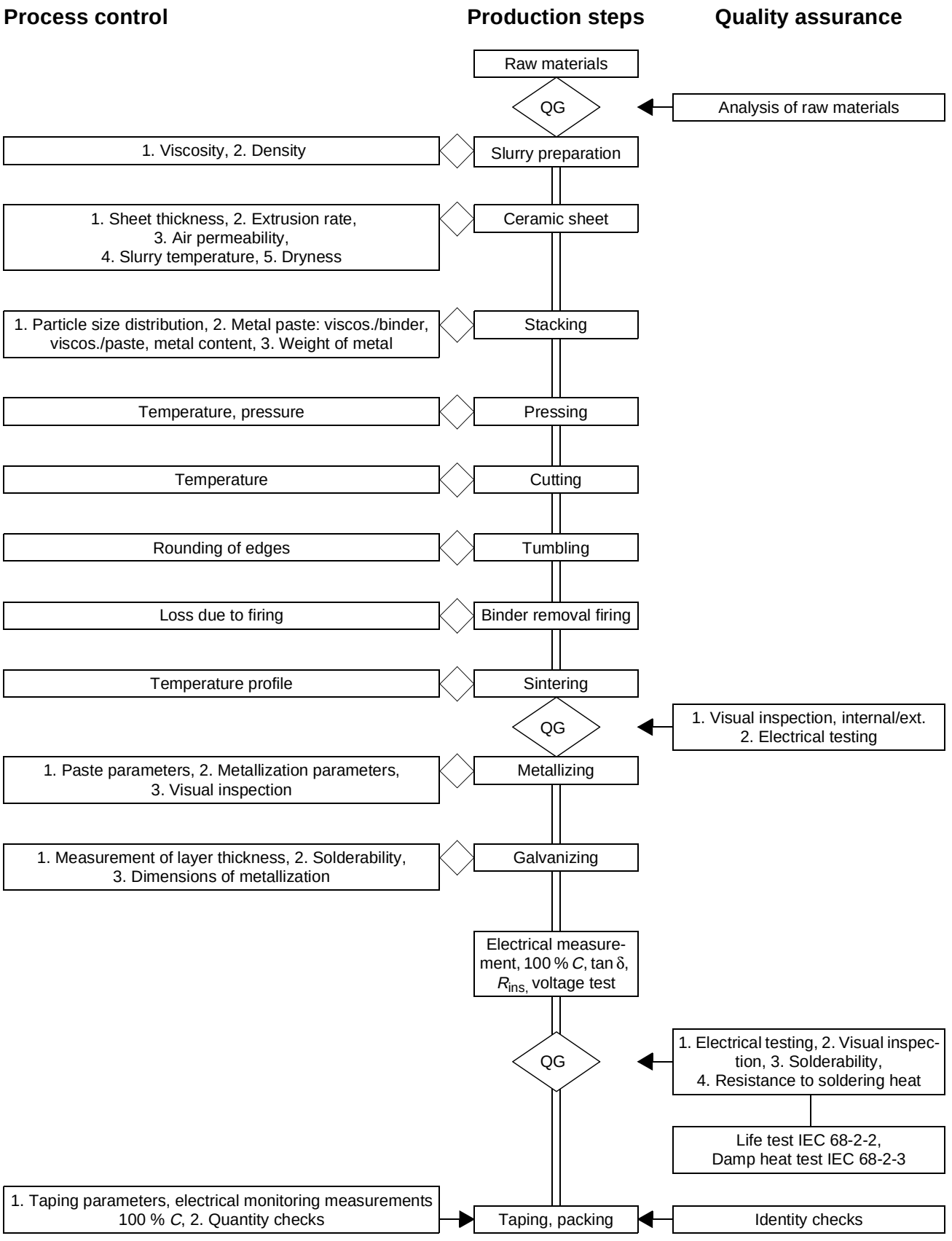
6 Dry heat tests

Test temperature	upper category temperature
Test voltage	1,5 · rated voltage
Test duration	1000 hours
Permissible capacitance changes	
C0G, CG	≤ 2 % or 1 pF (whichever is greater)
2C1, X7R, 2R1	≤ ± 10 %
Z5U (Y5U), 2F4	≤ ± 20 %
tan δ	
C0G, CG	$\leq 3 \cdot 10^{-3}$
2C1, X7R, 2R1	$\leq 50 \cdot 10^{-3}$
Z5U (Y5U), 2F4	$\leq 70 \cdot 10^{-3}$
Insulation resistance	
C0G, CG	$\geq 10^4$ MΩ
2C1, X7R, 2R1	$\geq 2 \cdot 10^3$ MΩ or time constant $\tau \geq 50$ s (whichever is lower)
Z5U (Y5U), 2F4	$\geq 2 \cdot 10^3$ MΩ or time constant $\tau \geq 50$ s (whichever is lower)

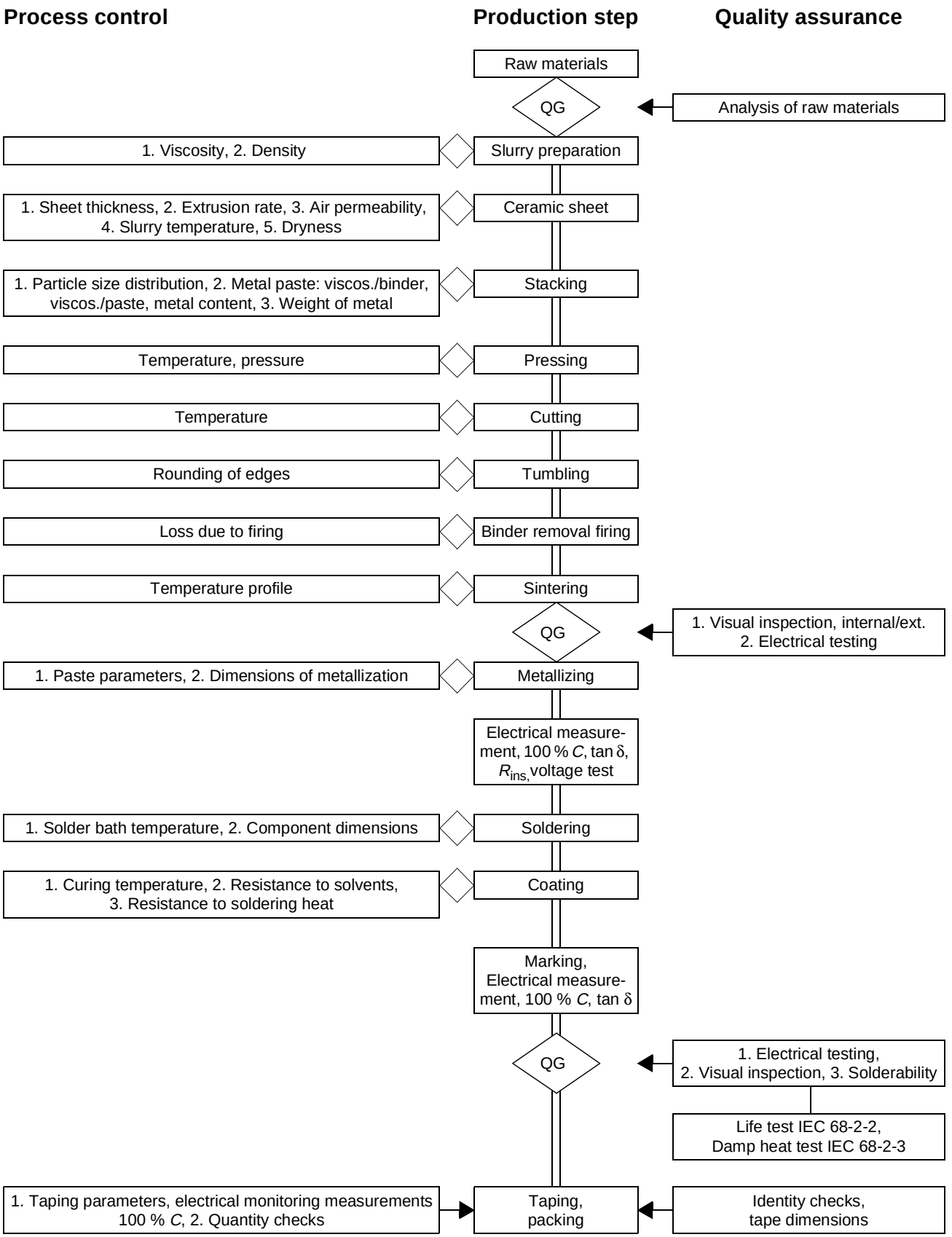
7 Damp heat tests

Test temperature	(40 ± 2) °C
Relative humidity	93 + 2 /– 3 %
Test voltage	rated voltage
Test duration	56 days
Permissible capacitance changes	
C0G, CG	≤ 2 % or 1 pF (whichever is greater)
2C1, X7R, 2R1	≤ ± 10 %
Z5U (Y5U), 2F4	≤ ± 20 %
tan δ	
C0G, CG	$\leq 3 \cdot 10^{-3}$
2C1, X7R, 2R1	$\leq 50 \cdot 10^{-3}$
Z5U (Y5U), 2F4	$\leq 70 \cdot 10^{-3}$
Insulation resistance	
C0G, CG	$\geq 5 \cdot 10^3$ MΩ
2C1, X7R, 2R1	$\geq 10^3$ MΩ or time constant $\tau \geq 25$ s (whichever is lower)
Z5U (Y5U), 2F4	$\geq 10^3$ MΩ or time constant $\tau \geq 25$ s (whichever is lower)

1 Manufacturing process and quality assurance of chip capacitors



2 Manufacturing process and quality assurance of leaded capacitors



3 Introduction

In order to meet the high technical demands of a free world market, the S + M Ceramic Components Division has established a comprehensive quality assurance system.This is based on the standards series EN 29 000 - EN 29 004 (ISO 9000 – ISO 9004), CECC as well as on customer requirements. Certification in accordance with EN 29 001 (ISO 9001) was been obtained in September 1991.

4 Quality assurance procedure

The quality department has examined the ceramic multilayer capacitors described in this data book according to the following criteria: compliance with type specifications, state of production plant and measuring and test engineering, and has ultimately passed them for production.

The following tests are carried out in order to ensure a consistently high quality:

4.1 Incoming goods inspection

The parts and materials required for manufacturing are inspected for dimensional accuracy and material characteristics according to a defined procedure.

4.2 Process control

A variety of measures is implemented - wherever possible at the source - in order to achieve the objective of eliminating defects as efficiently as possible. Already at the preliminary stage, FMEA (Failure Mode and Effects Analysis) is applied: *potential* errors are given a risk priority figure corresponding to their significance and the probability of their occurrence and detection. If the risk priority figure is high, remedial measures are introduced right from the start. During production, the processes are monitored using SPC (Statistical Process Control) methods: on-the-spot action is taken immediately if a process starts to deviate from the desired results,. All important manufacturing processes are continuously monitored, parallel to the production process.

4.3 Product assurance

So-called “QC gates” are planned into the manufacturing process, i.e. an inspection takes place at the end of each step before the products are passed on to the next step. Continuous monitoring and evaluation of the test results are used to assess procedures and to determine how well the processes are mastered (cf. 4.2).

4.4 Final inspection

Ceramic capacitors are subjected to a type-specific final inspection in which their electrical characteristics and finish are checked.

5 Delivery quality

The term “delivery quality” is used to indicate conformance with the mutually agreed specifications at the time of delivery.

6 Random sampling

There are standardized random sampling plans for inspection of incoming components by the customer. These, in conjunction with the respective predefined AQL values, determine whether a delivery lot will be accepted or rejected.

The scope and the maximum permissible number of defects of a random sample inspection are specified in IEC 410/ DIN 40 080 (identical in content to MIL-STD 105 D), simple sampling plan for normal inspection, inspection level II . The sampling instructions of this standard are that a delivered lot will be accepted with a high degree of probability (greater than 90%), if the percentage of defectives does not exceed the specified AQL (Acceptable Quality Level).

As a rule, the percentage of defects in our deliveries is significantly below the AQL figure. This is ensured by appropriate quality assurance measures in the manufacturing plant and is substantiated by final inspections.

7 Classification of defects

A component is defective if it does not meet the specifications given in the data sheet or another agreed delivery specification. A distinction is made between inoperatives, which usually exclude the functional use of the component, and less significant defects.

Inoperative ceramic capacitors are capacitors with:

– short circuit or open circuit
– breakage of component, terminals or encapsulation
– wrong or missing identification

Other defects of ceramic capacitors are:

– defects in electrical characteristics (electrical characteristics outside of specified limits)
– defects in mechanical properties (e. g. wrong dimensions, damaged case, illegible marking, bent terminals).

8 AQL figures

The following AQL figures apply to the defects listed above:

– inoperatives (electrical and mechanical)	0,065
– sum of electrical defectives	0,25
– sum of mechanical defectives	0,25

The sum totals also include the corresponding inoperatives.

9 Incoming goods inspection by the customer

The quality of our products is ensured by the procedures shown at the beginning of this section (cf. page 99 and 100). If the customer wishes to carry out an incoming goods inspection all the same, we recommend the use of the sampling inspection plan for normal inspection, inspection level II, in accordance with DIN 40 080. The inspection methods employed should be agreed upon by the customer and the supplier. Often stricter inspection criteria are agreed upon, whereby the size of the sample lot corresponds to the plan, but in which “zero defects” are required. i.e. the lot will only be accepted if it is entirely free of defects. Independent of such agreements, all random sample inspections made by S + M Components are subjected to such stricter criteria (zero defects).

The following details are required for judging any possible claims: test circuit, sample size, number of defectives found, sample defectives, lot number.

10 Reliability

Data on long-term reliability under severe or moderate operating conditions are obtained from endurance tests which are carried out continuously. The data are based on the failures registered for capacitors under a defined load. The long-term reliability of the individual types tested is based on a confidence level of 60 %. Our reliability data result from a large number of component operating hours and are continuously updated. The latest figures are always available upon request.

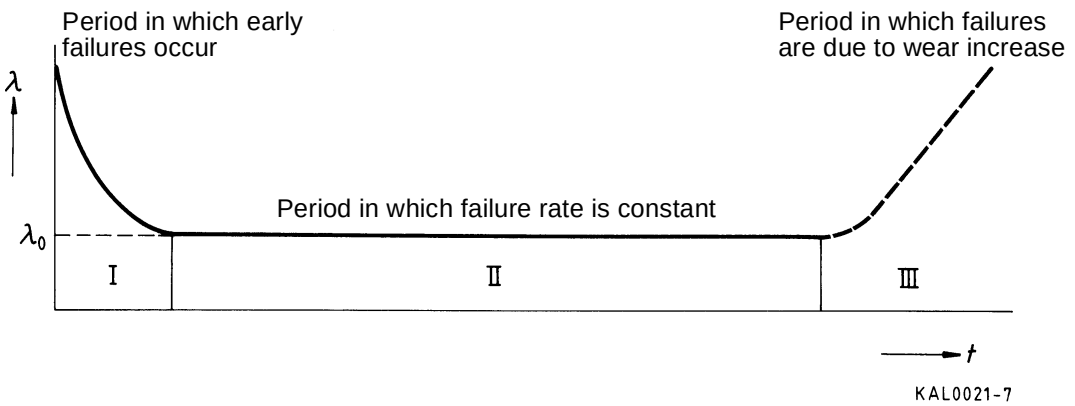
10.1 Failure rate

Information on component failure rates provide the manufacturer with a basis for reliability forecasts and allow him to estimate future service requirements.

If the fraction ΔN of a large number, N, of identical components fails during the time Δt, the failure rate (averaged over Δt) is indicated by $\lambda = \Delta N / (N \cdot \Delta t)$. The failure rate depends on the failure criteria, the load and the operating time.

The dimension of the failure rate is the reciprocal of time and the unit used is 10^{-9} / h = 1 fit (failure in time).

10.2 Failure periods



Region II is assumed to be the “service period” of components. It is thus considered to be sufficient to state the (virtually) constant failure rate λ_0 .

10.3 Reference conditions

Unless otherwise agreed upon, the failure rates of ceramic capacitors are based on the following conditions:

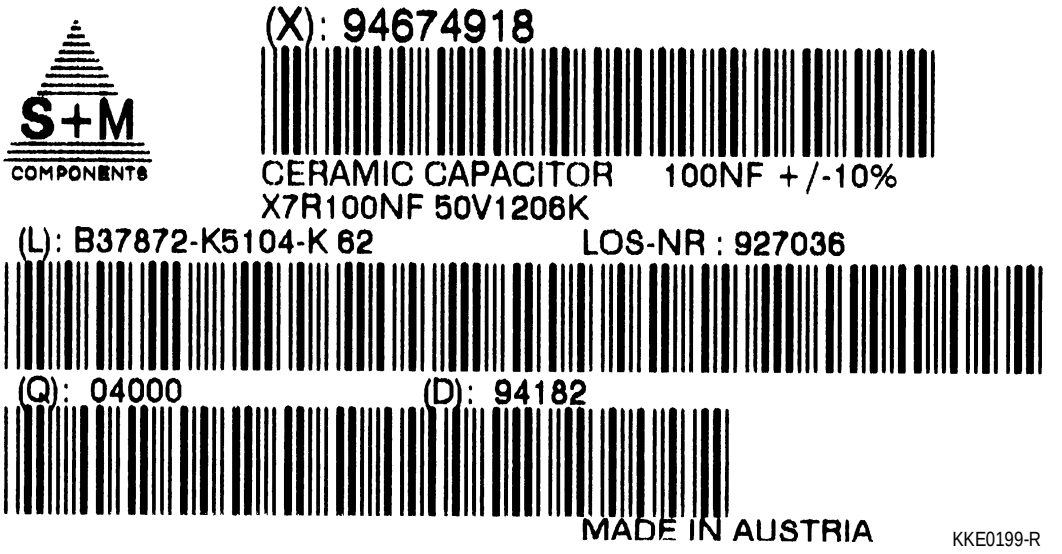
ambient temperature 40 °C, operating at 50 % of rated voltage V_R.

11 Identification and traceability

The packing of all delivered ceramic multilayer capacitors has a barcode label with details of type, ordering code, quantity, manufacturing date and lot number. This information is required in order to process complaints quickly and efficiently.

Due to our systematic, unambiguous identification system, each component and inspection report can be allocated to a specific production lot. If we know the lot number, we can retrace the component back through the entire production process, right back to purchasing.

Example of a label with internal fabrication number (X), supplier code (L), quantity (Q) and date code (year/calendar week/day) (D) as a barcode



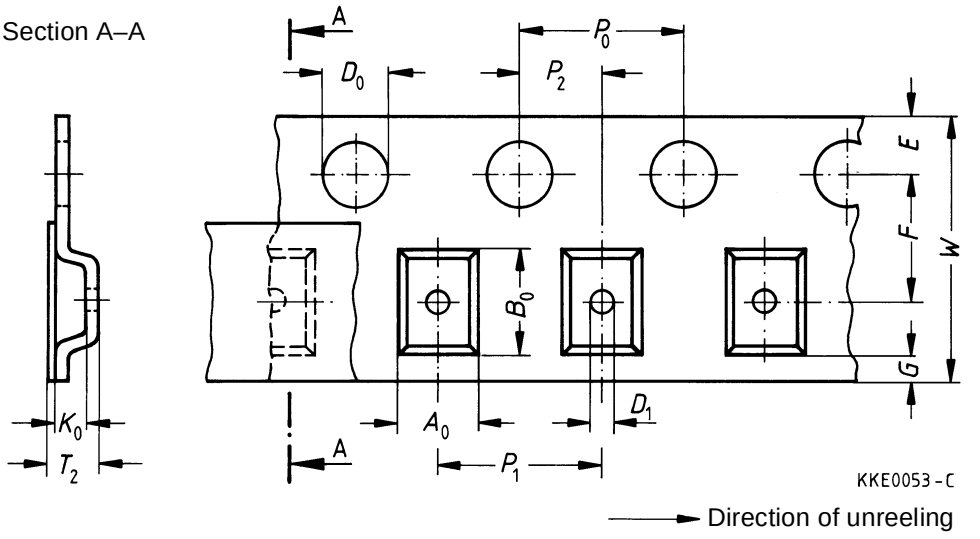
12 Supplementary information

The specification of quality data – which always refer to a fairly large number of components – does not constitute a guarantee of characteristics or properties in the legal sense. However, agreement on these specifications does not mean that the customer may not claim for replacement of individual defective capacitors within the terms of delivery. We cannot, however, assume any further liability beyond the replacement of defective components. We recommend that any requirements exceeding those mentioned here above are met by negotiating separate quality assurance agreements (German “Qualitätssicherungs-Vereinbarungen” - QSV).

Furthermore, it must be taken into consideration that the figures stated for service life and failure rate refer to the average production status and are to be understood as mean values (statistical expectations) for a large number of delivery lots of identical capacitors. These figures are based on application experience and on data obtained from preceding tests under normal conditions, or – for purposes of accelerated aging – more severe conditions.

1 Taping of chip capacitors

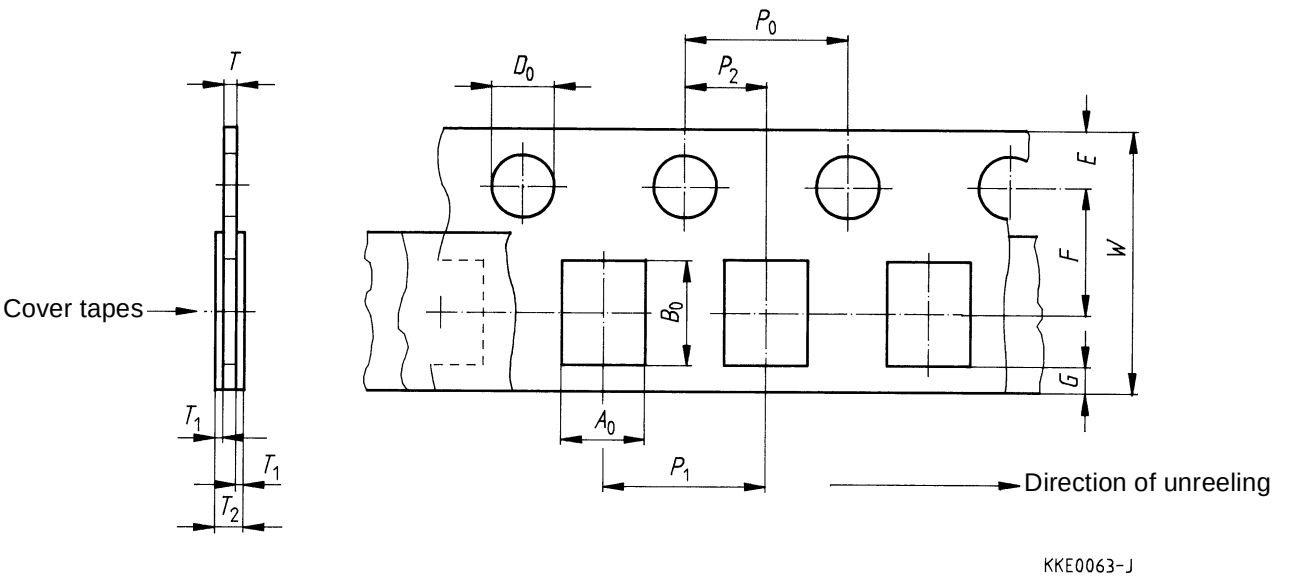
1.1 **Blister tape** (taping in accordance with IEC 286-3)



Dimensions (mm)	Size (8-mm tape) 0805	1206	1210	Size (12-mm tape) 1812	2220	Tolerance
$A_0 \times B_0$	1,6 × 2,4	1,9 × 3,5	2,8 × 3,5	3,5 × 4,8	5,1 × 6,0	± 0,2
K_0	0,7 (slim-line); 0,9; 1,3 (standard)			1,3		max.
T_2	2,5			4,5		max.
D_0	1,5			1,5		+ 0,1/ – 0
D_1	1,0			1,5		min.
P_0	4,0			4,0		± 0,1[1)]
P_2	2,0			2,0		± 0,05
P_1	4,0			8,0		± 0,1
W	8,0			12,0		± 0,3
E	1,75			1,75		± 0,1
F	3,5			3,5		± 0,05
G	0,75			0,75		min.

1) ≤ 0,2 mm over 10 hole spaces

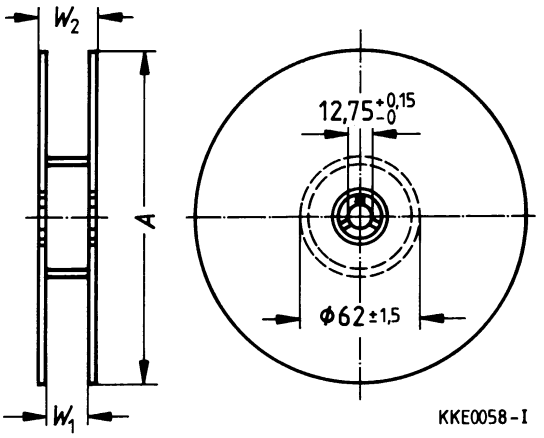
1.2 **Cardboard tape** (taping in accordance with IEC 286-3)

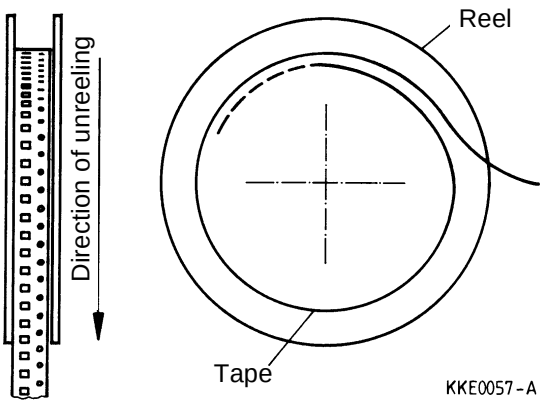


Dimensions (mm)	Size (8-mm tape) 0402	0603	0805	1206	Tolerance
$A_0 \times B_0$	1,15 × 0,6	0,95 × 1,8	1,45 × 2,25	2,0 × 3,6	± 0,2
T	0,6	0,7 (slim-line;) 0,9 (standard)			max.
T_2	0,7	0,9	1,1		max.
D_0	1,5	1,5			± 0,1
P_0	4,0	4,0			± 0,1[1)]
P_2	1,0	2,0			± 0,05
P_1	2,0	4,0			± 0,1
W	8,0	8,0			± 0,3
E	1,75	1,75			± 0,1
F	3,5	3,5			± 0,05
G	0,75	0,75			min.

1) ≤ 0,2 mm over 10 hole spaces

1.3 Reel packaging





8-mm tape

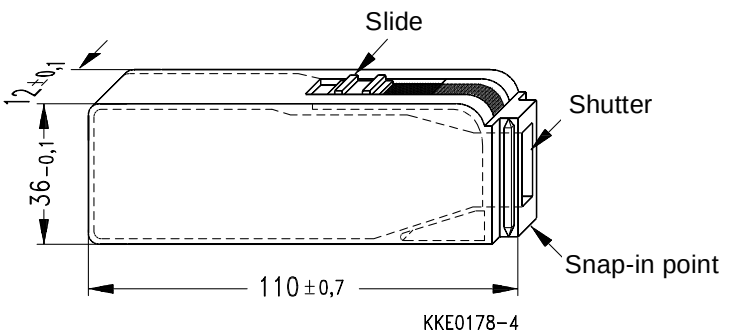
Dimensions	180-mm tape reel	330-mm tape reel
A	180 – 2/+ 0	330 ± 2,0
W_1	8,4 + 1,5/– 0	8,4 + 1,5/– 0
W_2	14,4 max.	14,4 max.

12-mm tape

Dimensions	180-mm tape reel	330-mm tape reel
A	180 – 2/+ 0	330 ± 2,0
W_1	12,4 + 1,5/– 0	12,4 + 1,5/– 0
W_2	18,4 max.	18,4 max.

1.4 Bulk case packing

Part of our standard chip range (cf. page 18) is also available in bulk cases.



Packing units:

Case size	pcs
0603	15000
0805	10000
1206	5000

Advantages of bulk case packaging:

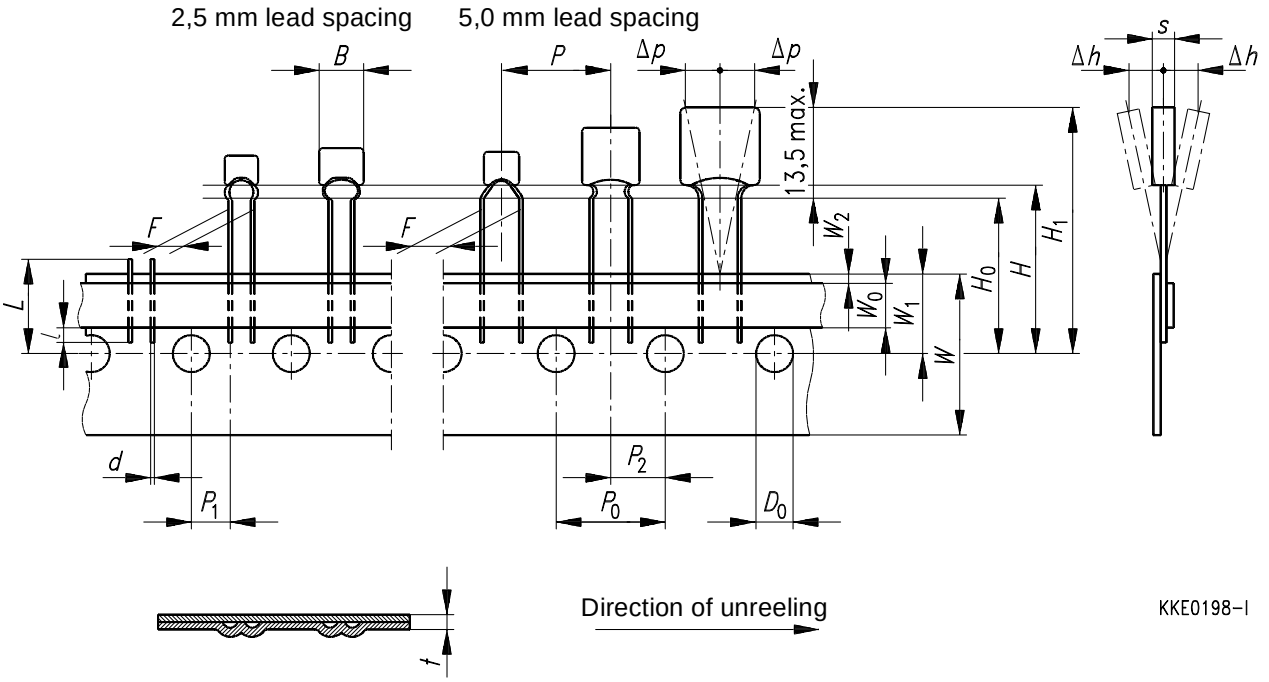
- Environmentally compatible material; considerably less packaging material (1/30 of blister packing)
- Small package sizes (110 × 36 × 12) mm with appropriately low storage requirements
- Can be used several times (less waste)
- No standstill-times during production, since packages can be refilled or replaced while component mounting is in progress
- High component placement reliability if the bulk feeder is used

1.5 Packing units for chip capacitors

Size	Temperature characteristic	Chip thickness (± 0,1 mm)	Packing units (in 1000 pcs)			
			Tape	Reel		Bulk case
				180 mm dia.	330 mm dia.	
0402	C0G/CG, X7R/2R1, Z5U(Y5U)/2F4	0,5	8 mm [1]	12,0	–	–
0603	C0G/CG, 2C1 X7R/2R1, Z5U(Y5U)/2F4	0,8	8 mm [1]	4,0	16,0	15,0
0805	C0G/CG, 2C1 X7R/2R1, Z5U(Y5U)/2F4	0,6 0,8 1,2	8 mm	5,0 4,0 3,0	20,0 16,0 12,0	10,0 – –
1206	C0G/CG, 2C1 X7R/2R1, Z5U(Y5U)/2F4	0,6 0,8 1,2	8 mm	4,0 4,0 3,0	16,0 16,0 12,0	5,0 – –
1210	C0G/CG, 2C1 X7R/2R1, Z5U(Y5U)/2F4	0,6 0,8 1,2	8 mm [2]	4,0 4,0 3,0	16,0 16,0 12,0	– – –
1812	2C1, X7R/2R1, Z5U(Y5U)/2F4	1,2	12 mm [2]	1,5	5,0	–
2220	2C1, X7R/2R1, Z5U(Y5U)/2F4	1,2	12 mm [2]	1,5	5,0	–

1) only cardboard tape
2) only blister tape

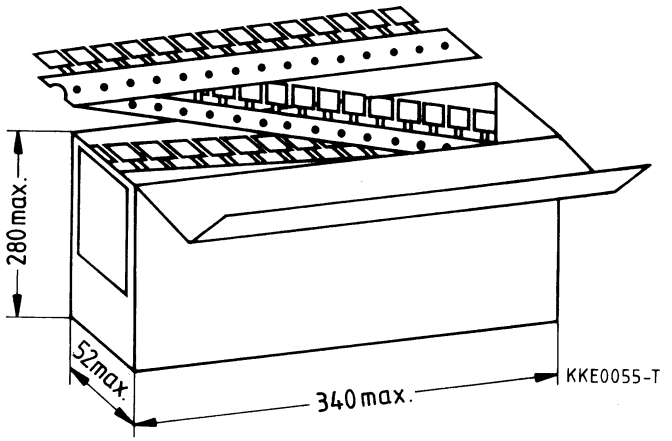
2 Taping of leaded capacitors (in accordance with IEC 286-2)



Dimensions (mm)	Lead spacing 2,5 mm	5,0 mm	Tolerance	Comments
B	11,0	11,0	max.	
s	3,1	5,0	max.	
d	0,55	0,55	± 0,05	
P	12,7	12,7	± 1,0	
P_0	12,7	12,7	± 0,2	± 1 mm / 20 hole spaces
P_1	5,1	3,85	± 0,7	
P_2	6,35	6,35	± 1,3	
F	2,5	5,0	+ 0,6/ – 0,1	
Δh	0	0	± 2,0	Measured at top of component body
Δp	0	0	± 1,3	
W	18,0	18,0	± 0,5	
W_0	5,5	5,5	min.	Peel force ≥ 5 N
W_1	9,0	9,0	± 0,5	
W_2	1,0	1,0	– 0,5	
H	18,0	18,0	+ 2,0/ – 0	
H_0	16,0	16,0	± 0,5	
H_1	32,2	32,2	max.	
D_0	4,0	4,0	± 0,2	
t	0,7	0,7	+ 0,2	
L	11,0	11,0	max.	
l	1,0	1,0	max.	

3 Types of packing

Ammo packing



Reel packing

Marking of Chip Capacitors

If so requested, our chip capacitors can also be supplied with markings.

– Size 0805 and smaller sizes are marked with the manufacturer's logo.
– All other sizes are marked with the manufacturer's logo and a two-digit code for the capacitance rating.
– The rated capacitance is coded by a letter and a numeral digit, as shown in the tables below.

Letter	Value	Letter	Value	Letter	Value
A	1,0	N	3,3	a	2,5
B	1,1	P	3,6	b	3,5
C	1,2	Q	3,9	d	4,0
D	1,3	R	4,3	e	4,5
E	1,5	S	4,7	f	5,0
F	1,6	T	5,1	m	6,0
G	1,8	U	5,6	n	7,0
H	2,0	V	6,2	t	8,0
J	2,2	W	6,8	y	9,0
K	2,4	X	7,5		
L	2,7	Y	8,2		
M	3,0	Z	9,1		

Numeral	Multiplier
9	10^{-1}
0	10^{0}
1	10^{1}
2	10^{2}
3	10^{3}
4	10^{4}
5	10^{5}
6	10^{6}

Examples: A5 = 100000 pF = 100 nF
f9 = 0,5 pF

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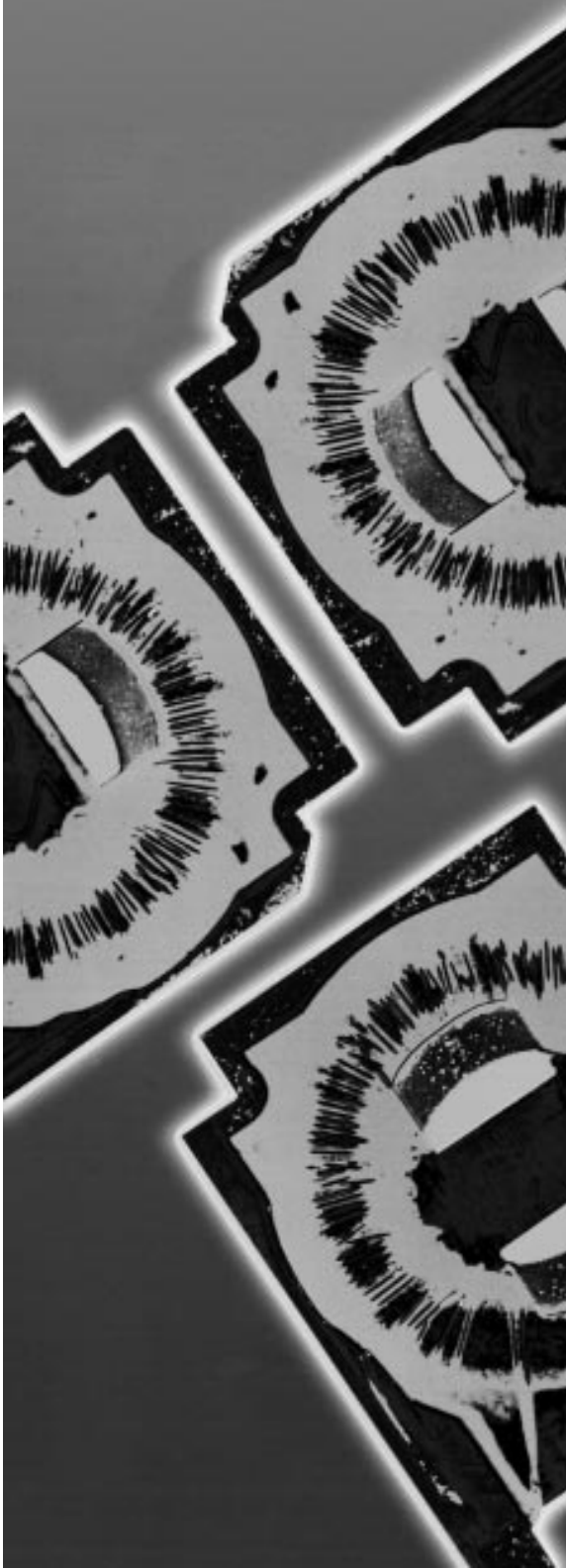
A whole lot of ring core chokes

Chokes to your choice

You urgently need particular ring core chokes? That's no problem, we have 200,000 pieces in stock and deliver reliably through SCS. Our automated production guarantees

the best of reliability too. It turns out chokes in different versions: flat and upright, with current rated from 0.4 to 16 A. UL and VDE approved, and complying with the latest EMC standards of course.

SCS – dependable, fast and competent



Delivery Modes and Ordering Code

Multilayer chip capacitors

Ordering codes can be determined according to the following system. Explicit ordering codes for standard types (these types are usually in stock) are given in the data sheets for the individual types. It is possible that the capacitance range which can be supplied will differ for other forms of packing. The different forms of taping for various chip capacitors (depending on the capacitance rating) are given in the chapter on “Packing units for chip capacitors”, page 108.

B37940- K 5 010- C 5 62

Packing
62 = blister tape, reel dia. 180 mm (82 = marked components)
72 = blister tape, reel dia. 330 mm (22 = marked components)
60 = cardboard tape, reel dia. 180 mm
70 = cardboard tape, reel dia. 330 mm
01 = bulk case

Decimal place for cap. values < 10 pF, otherwise not used

Capacitance tolerance (tolerance code in acc. with IEC 62, standard values bold)

	C0G/CG	2C1	X7R/2R1	Z5U(Y5U)/2F4
C_R < 10 pF:	B = ± 0,1 pF			
	C = ± 0,25 pF			
	D = ± 0,5 pF			
C_R ≥ 10 pF:	F = ± 1 %	**K = ± 10 %**	J = ± 5 %	**M = ± 20 %**
	G = ± 2 %	M = ± 20 %	**K = ± 10 %**	
	J = ± 5 %		M = ± 20 %	
	K = ± 10 %			

Capacitance, coded (These three digits must be specifically copied from the ordering codes for individual types.)

010 = 1 pF	101 = 100 pF	103 = 10 nF
100 = 10 pF	102 = 1 nF	104 = 100 nF

Rated voltage 0 = 25 Vdc, 5 = 50 Vdc, 1 = 100 Vdc

Terminals Standard: K = silver/nickel/tin, A = silver/nickel
Slim-line: D = silver/nickel/tin, E = silver/nickel

Type and size

Chip size	Temperature characteristic C0G/CG	2C1	X7R/2R1	Z5U(Y5U)/2F4
0402	B37920		B37921	B37922
0603	B37930	B37731	B37931	B37932
0805	B37940	B37741	B37941	B37942
1206	B37871	B37672	B37872	B37873
1210	B37949	B37750	B37950	B37951
1812		B37753	B37953	B37954
2220		B37756	B37956	B37957

Leaded multilayer capacitors,
EIA standard

Ordering codes can be determined according to the following system. Explicit ordering codes for standard types (these types are usually in stock) are given in the data sheets for the individual types.

B37979-N 1 040- D 7 51

Packing
51 = reel dia. 360 mm
54 = Ammo pack
00 = bulk (for capacitance values < 10 pF)
without code (fùr capacitance values ≥ 10 pF)

Decimal place
for capacitance values < 10 pF, otherwise not used

Capacitance tolerance (tolerance code letter in accordance with IEC 62, standard values in bold print)

	for C0G	for X7R	for Z5U(Y5U)
C_R < 10 pF:	**D = ± 0,5 pF**	**K = ± 10 %**	**M = ± 20 %**
	F = ± 1,0 pF	M = ± 20 %	
C_R ≥ 10 pF:	**J = ± 5 %**		
	K = ± 10 %		

Capacitance
coded: 010 = 1 pF 101 = 100 pF 103 = 10 nF
100 = 10 pF 102 = 1 nF 104 = 100 nF
(These three digits must be specifically copied from the ordering codes for individual types.)

Rated voltage
5 = 50 Vdc, 1 = 100 Vdc

Type and size

With radial leads EIA standard		Temperature characteristic C0G	X7R	Z5U(Y5U)
Lead spacing 2,5 mm	5,5 × 5,0 × 2,5	B37979-N	B37981-M	B37982-N
	6,5 × 5,0 × 2,5	B37986-N	B37987-M	B37988-N
Lead spacing 5,0 mm	5,5 × 5,0 × 2,5	B37979-G	B37981-F	B37982-G
	6,5 × 5,0 × 2,5	B37986-G	B37987-F	B37988-G
	9,0 × 7,5 × 2,5		B37984-M	B37985-N

Leaded multilayer capacitors,
CECC standard

Ordering codes can be determined according to the following system. Explicit ordering codes for standard types (these types are usually in stock) are given in the data sheets for the individual types.

B37979-K 1 040- D 7 51

Packing
51 = reel dia. 360 mm
54 = Ammo pack
00 = bulk (for capacitance values < 10 pF)
without code (for capacitance values ≥ 10 pF)

Decimal place
for capacitance values < 10 pF, otherwise not used

Capacitance tolerance (tolerance code letter in accordance with IEC 62, standard values in bold print)

	for CG	for 2C1	for 2F4
C_R < 10 pF:	**D = ± 0,5 pF**	**K = ± 10 %**	**M = ± 20 %**
	F = ± 1,0 pF	M = ± 20 %	
C_R ≥ 10 pF:	**J = ± 5 %**		
	K = ± 10 %		

Capacitance
coded: 010 = 1 pF 101 = 100 pF 103 = 10 nF
100 = 10 pF 102 = 1 nF 104 = 100 nF
(These three digits must be specifically copied from the ordering codes for individual types.)

Rated voltage
5 = 50 Vdc, 1 = 100 Vdc

Type and size

With radial leads CECC standard		Temperature characteristic CG	2C1	2F4
Lead spacing 2,5 mm	5,5 × 3,8 × 2,5	B37979-K	B37981-K	B37982-K
	6,5 × 5,0 × 2,5	B37986-K	B37987-K	B37988-K
Lead spacing 5,0 mm	5,5 × 3,8 × 2,5	B37979-D	B37981-D	B37982-D
	6,5 × 5,0 × 2,5	B37986-D	B37987-D	B37988-D
	9,0 × 7,5 × 2,5		B37984-K	B37985-K

A	Area
C	Capacitance of capacitor
C_0	Initial (original) capacitance
C_1	Capacitance value after one hour's use
C_R	Rated capacitance
C_{20}	Capacitance at 20 °C
C_{25}	Capacitance at 25 °C
D	Bending displacement
E_a	Activation energy
ESR	Equivalent series resistance
F	Force
f	Frequency
f_{meas}	Measuring frequency
k	Ageing constant
L	Inductance
N	Quantity (integer values)
P_V	Power dissipation or loss
Q_{el}	Electrical charge
Q	Quality
R_P	Parallel resistance
R_S	Series resistance
S_V	Rate of rise of a voltage pulse
T	Temperature
T_{meas}	Measuring temperature
t	Time
t_R	Rise time of a voltage pulse
V	Voltage
V_0	Initial (original) voltage (basic voltage level)
V_{meas}	Measuring voltage
V_R	Rated voltage
V_S	Amplitude of a voltage pulse
V_{rms}	Measuring (root-mean-square or effective) alternating voltage
$\|Z\|$	Magnitude of impedance (ac resistance)
α	Temperature coefficient
Δ	Tolerance, change
ε_0	Absolute dielectric constant
ε_r	Relative dielectric constant
λ	Failure rate

Abbreviations / General notes

SMD — Surface-mount devices

CECC mark of conformance

Dimensions are given in millimeters.
Decimal points are indicated by commas.