EPCOS

Multilayer Chip Capacitors

C0G/NP0

SMD

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

Terminations

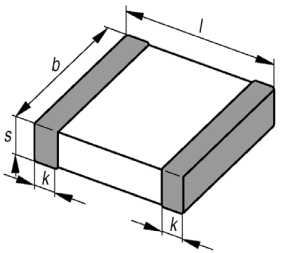
- For soldering: Ni barrier terminations
- For conductive adhesion: silver palladium

Packing

- Blister and cardboard tape, for details refer to chapter on "Taping and Packing", page 14.
- Bulk case for sizes 0402, 0603, for details see page17.

Maximum ratings

Climatic category
in accordance with IEC 60068-1: 55/125/56



KKE0272-V

Dimensions (mm)

Size **inch**/ mm	*l*	*b*	*s*	*k*
0402/ 1005	1,0 ± 0,10	0,50 ± 0,05	0,5 ± 0,05	0,10 - 0,30
0603/ 1608	1,6 ± 0,15*)	0,80 ± 0,10	0,8 ± 0,10	0,10 - 0,40
0805/ 2012	2,0 ± 0,20	1,25 ± 0,15	1,3 max.	0,13 - 0,75
1206/ 3216	3,2 ± 0,20	1,60 ± 0,15	1,3 max.	0,25 - 0,75
1210/ 3225	3,2 ± 0,30	2,50 ± 0,30	1,7 max.	0,25 - 0,75

Tolerances in acc. with CECC 32101-801
*) For bulk cases: 1,6 ± 0,1

Available capacitance tolerances

Rated capacitance C_R	Tolerance	Symbol
C_R < 10 pF:	ΔC_R = ± 0,1 pF	B
	ΔC_R = ± 0,25 pF	**C**
	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
	$\Delta C_R/C_R$ = ± 5 %	**J**
	$\Delta C_R/C_R$ = ± 10 %	K

Standard tolerances in bold print
F and G tolerance not available for 200 V

Rated voltage value

V_R = 50 V, 100 V, 200 V

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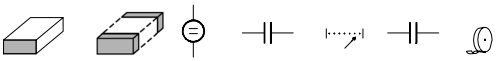


B37940 K 5 010 C 5 60

Packaging

62 = blister tape, reel dia. 180 mm
72 = blister tape, reel dia. 330 mm
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 0

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

C0G / NP0

C_R < 10 pF: B = ± 0,1 pF
C = ± 0,25 pF
D = ± 0,5 pF

C_R ≥ 10 pF: F = ± 1 %
G = ± 2 %
J = ± 5 %
K = ± 10 %

Capacitance, coded 010 = 1 pF 101 = 100 pF 103 = 10 nF 105 = 1 µF
100 = 10 pF 102 = 1 nF 104 = 100 nF 474 = 470 nF

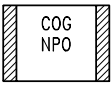
Rated voltage

Rated voltage [Vdc]	50	100	200
Code	5	1	2

Terminations Standard: K = silver/nickel/tin for chip sizes 0402, 0603, 0805, 1206, 1210
for conductive adhesion: all sizes

Type and size

Chip size (**inch** / mm)	Temperature characteristics C0G / NP0
0402 / 1005	B37920
0603 / 1608	B37930
0805 / 2012	B37940
1206 / 3216	B37871
1210 / 3225	B37949



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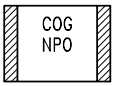
Electrical characteristics

Temperature characteristic Standard	C0G/NP0 EIA
Dielectric	Class 1
Rated voltage V_R Vdc	50/100/200
Climatic category (IEC 68-1)	55/125/56
Temperature range	– 55 ... + 125 °C
Available capacitance values C_R E series	1 pF … 10 nF E12
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)] ± 2 %[2)] ± **5 %** ± 10 %
Temperature coefficient (tolerance)	$0 \pm 30 \cdot 10^{-6}$/K
Voltage test	$2{,}5 \cdot V_R$/5 s
Dissipation factor tan δ (limit value)	$< 1{,}0 \cdot 10^{-3}$
Insulation resistance[1)] at 25 °C 125 °C	 $> 10^5$ MΩ $> 10^4$ MΩ

1) 1 % and 2 % tolerance not for 200 V.

Multilayer Chip Capacitors

C0G/NP0



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Product range

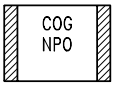
	C0G/NP0											
Size[1] **inch** mm	**0402** 1005		**0603** 1608		**0805** 2012			**1206** 3216			**1210** 3225	
Type	B37920		B37930		B37940			B37871			B37949	
V_R (Vdc)	50		50		50	100	200	50	100	200	50	200
1,0 pF	1,0 pF											
1,2 pF												
1,5 pF												
1,8 pF												
2,2 pF	2,0 pF[2]											
2,7 pF	3,0 pF[2]											
3,3 pF	4,0 pF[2]											
3,9 pF	5,0 pF[2]											
4,7 pF	6,0 pF[2]											
5,6 pF	7,0 pF[2]											
6,8 pF	8,0 pF[2]											
8,2 pF	9,0 pF[2]											
10 pF												
12 pF												
15 pF												
18 pF												
22 pF												
27 pF												
33 pF												
39 pF												
47 pF												
56 pF												
68 pF												
82 pF												

Chip thickness (s): 0,5 ± 0,1 mm | 0,6 ± 0,1 mm | 0,8 ± 0,1 mm | 1,2 ± 0,1 mm

1) l × b (inch) / l × b (mm)
2) Only listed capacitance values available
Capacitance values < 1 pF upon request

Multilayer Chip Capacitors

C0G/NP0



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Product range

	C0G/NP0												
Size[1)] **inch** mm	**0402** 1005		**0603** 1608		**0805** 2012			**1206** 3216			**1210** 3225		
Type	B37920		B37930		B37940			B37871			B37949		
V_R (Vdc)	50		50		50	100	200	50	100	200	50	100	200
100 pF													
120 pF													
150 pF													
180 pF													
220 pF													
270 pF													
330 pF													
390 pF													
470 pF													
560 pF													
680 pF													
820 pF													
1,0 nF													
1,2 nF													
1,5 nF													
1,8 nF													
2,2 nF													
2,7 nF													
3,3 nF													
3,9 nF													
4,7 nF													
5,6 nF													
6,8 nF													
8,2 nF													
10 nF													

Chip thickness (*s*): 0,5 ± 0,1 mm | 0,6 ± 0,1 mm | 0,8 ± 0,1 mm | 1,2 ± 0,1 mm | 1,6 ± 0,1 mm

1) l × b (inch) / l × b (mm)

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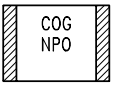
Ordering codes for C0G/NP0, 50 Vdc, Ni barrier terminations

Size	0402/1005	0603/1608	0805/2012	1206/3216	B1210/3225
C_R [1]	Ordering code [2]				
	B37920	B37930	B37940	B37871	B37949
1,0 pF	K5010C060 ▲	K5010C060 ❍	K5010C060 ❑	K5010C060 ❍	
1,2 pF		K5010C260 ❍			
1,5 pF		K5010C560 ❍	K5010C560 ❑	K5010C560 ❍	
1,8 pF		K5010C860 ❍			
2,2 *(2,0)* pF	*K5020C060* ▲	K5020C260 ❍	K5020C260 ❑	K5020C260 ❍	
2,7 *(3,0)* pF	*K5030C060* ▲	K5020C760 ❍			
3,3 *(4,0)* pF	*K5040C060* ▲	K5030C360 ❍	K5030C360 ❑	K5030C360 ❍	
3,9 *(5,0)* pF	*K5050C060* ▲	K5030C960 ❍			
4,7 *(6,0)* pF	*K5060C060* ▲	K5040C760 ❍	K5040C760 ❑	K5040C760 ❍	
5,6 *(7,0)* pF	*K5070C060* ▲	K5050C660 ❍			
6,8 *(8,0)* pF	*K5080C060* ▲	K5060C860 ❍	K5060C860 ❑	K5060C860 ❍	
8,2 *(9,0)* pF	*K5090C060* ▲	K5080C260 ❍			
10 pF	K5100J060 ▲	K5100J060 ❍	K5100J060 ❑	K5100J060 ❍	
12 pF	K5120J060 ▲	K5120J060 ❍			
15 pF	K5150J060 ▲	K5150J060 ❍	K5150J060 ❑	K5150J060 ❍	
18 pF	K5180J060 ▲	K5180J060 ❍			
22 pF	K5220J060 ▲	K5220J060 ❍	K5220J060 ❑	K5220J060 ❍	
27 pF	K5270J060 ▲	K5270J060 ❍			
33 pF	K5330J060 ▲	K5330J060 ❍	K5330J060 ❑	K5330J060 ❍	
39 pF	K5390J060 ▲	K5390J060 ❍			
47 pF	K5470J060 ▲	K5470J060 ❍	K5470J060 ❑	K5470J060 ❍	
56 pF	K5560J060 ▲	K5560J060 ❍			
68 pF	K5680J060 ▲	K5680J060 ❍	K5680J060 ❑	K5680J060 ❍	
82 pF	K5820J060 ▲	K5820J060 ❍			
100 pF	K5101J060 ▲	K5101J060 ❍	K5101J060 ❑	K5101J060 ❍	
120 pF	K5121J060 ▲	K5121J060 ❍			
150 pF	K5151J060 ▲	K5151J060 ❍	K5151J060 ❑	K5151J060 ❍	
180 pF	K5181J060 ▲	K5181J060 ❍			
220 pF	K5221J060 ▲	K5221J060 ❍	K5221J060 ❑	K5221J060 ❍	
270 pF		K5271J060 ❍			
330 pF		K5331J060 ❍	K5331J060 ❑	K5331J060 ❍	
390 pF		K5391J060 ❍			
470 pF		K5471J060 ❍	K5471J060 ❑	K5471J060 ❍	
560 pF					
680 pF			K5681J060 ❑	K5681J060 ❍	
820 pF					

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

1) E12/E24 series available on request. For size 0402 only capacitance values in ( ) available; capacitance values < 1 pF on request.

2) The tables contain the ordering codes for the standard capacitance tolerance:
C = ± 0,25 pF for < 10 pF; J = ± 5 % for ≥ 10 pF. Example: B37920K5010**C**060. For other available capacitance tolerances see page 1



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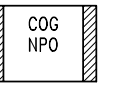
Ordering codes for C0G/NP0, 50 Vdc, Ni barrier terminations (cont´d)

Size	0402/1005	0603/1608	0805/2012	1206/3216	1210/3225
C_R [1]	Ordering code [2]				
	B37920	B37930	B37940	B37871	B37949
1,0 nF			K5102J060 ❑	K5102J060 ❍	K5102J062 ❍
1,2 nF					
1,5 nF			K5152J060 ❍	K5152J060 ❍	K5152J062 ❍
1,8 nF					
2,2 nF			K5222J062 ◆	K5222J060 ❍	K5222J062 ❍
2,7 nF					
3,3 nF				K5332J060 ❍	K5332J062 ❍
3,9 nF					
4,7 nF				K5472J062 ◆	K5472J062 ❍
5,6 nF					
6,8 nF					K5682J062 ❍
8,2 nF					
10 nF					K5103J062 ◆

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

1) E12/E24 series available on request
2) The tables contain the ordering codes for the standard capacitance tolerance:
C = ± 0,25 pF for < 10 pF; **J** = ± 5 % for ≥ 10 pF. Example: B37940K5102**J**060
For other available capacitance tolerances see page 1



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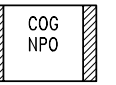
Ordering codes for C0G/NP0, 100 Vdc, Ni barrier terminations

Size	0805/2012		1206/3216	
C_R	Ordering code [1]			
	B37940		B37871	
1,0 pF	K1010C060	❑	K1010C060	❍
1,2 pF				
1,5 pF	K1010C560	❑	K1010C560	❍
1,8 pF				
2,2 pF	K1020C260	❑	K1020C260	❍
2,7 pF				
3,3 pF	K1030C360	❑	K1030C360	❍
3,9 pF				
4,7 pF	K1040C760	❑	K1040C760	❍
5,6 pF				
6,8 pF	K1060C860	❑	K1060C860	❍
8,2 pF				
10 pF	K1100J060	❑	K1100J060	❍
12 pF				
15 pF	K1150J060	❑	K1150J060	❍
18 pF				
22 pF	K1220J060	❑	K1220J060	❍
27 pF				
33 pF	K1330J060	❑	K1330J060	❍
39 pF				
47 pF	K1470J060	❑	K1470J060	❍
56 pF				
68 pF	K1680J060	❑	K1680J060	❍
82 pF				
100 pF	K1101J060	❑	K1101J060	❍
120 pF				
150 pF	K1151J060	❑	K1151J060	❍
180 pF				
220 pF	K1221J060	❑	K1221J060	❍
270 pF				
330 pF	K1331J060	❑	K1331J060	❍
390 pF				
470 pF	K1471J060	❑	K1471J060	❍
560 pF				
680 pF	K1681J060	❍	K1681J060	❍
820 pF				
1,0 nF	K1102J062	◆	K1102J060	❍

Size	1206/3216		1210/3225	
C_R	Ordering code [1]			
	B37871		B37949	
1,2 nF				
1,5 nF	K1152J060	❍	K1152J060	❍
1,8 nF				
2,2 nF	K1222J062	◆	K1222J060	❍
2,7 nF				
3,3 nF			K1332J060	❍
3,9 nF				
4,7 nF			K1472J062	◆
5,6 nF				
6,8 nF			K1682J062	◆

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

1) The tables contain the ordering codes for the standard capacitance tolerance:
C = ± 0,25 pF for < 10 pF; J = ± 5 % for ≥ 10 pF. Example: B37940K1010**C**060
For other available capacitance tolerances see page 1



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Ordering codes for C0G/NP0, 200 Vdc, Ni barrier terminations

Size	0805/2012	1206/3216	1210/3225		
C_R	Ordering code[1]				
	B37940	B37871	B37949		
1,0 pF		K2010C060 ❍			
1,2 pF					
1,5 pF		K2010C560 ❍			
1,8 pF					
2,2 pF	K2020C260 ❑	K2020C260 ❍			
2,7 pF					
3,3 pF	K2030C360 ❑	K2030C360 ❍			
3,9 pF					
4,7 pF	K2040C760 ❑	K2040C760 ❍			
5,6 pF					
6,8 pF	K2060C860 ❑	K2060C860 ❍			
8,2 pF					
10 pF	K2100J060 ❑	K2100J060 ❍			
12 pF					
15 pF	K2150J060 ❑	K2150J060 ❍			
18 pF					
22 pF	K2220J060 ❑	K2220J060 ❍			
27 pF					
33 pF	K2330J060 ❑	K2330J060 ❍			
39 pF					
47 pF	K2470J060 ❑	K2470J060 ❍			
56 pF					
68 pF	K2680J060 ❑	K2680J060 ❍			
82 pF					
100 pF	K2101J060 ❑	K2101J060 ❍	K2101J062 ❍		
120 pF					
150 pF		K2151J060 ❍	K2151J062 ❍		
180 pF					
220 pF		K2221J060 ❍	K2221J062 ❍		
270 pF					
330 pF		K2331J060 ❍	K2331J062 ❍		
390 pF					
470 pF		K2471J060 ❍	K2471J062 ❍		
560 pF					
680 pF		K2681J062 ◆	K2681J062 ❍		
820 pF					

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

1) The tables contain the ordering codes for the standard capacitance tolerance:
C = ± 0,25 pF for < 10 pF; J = ± 5 % for ≥ 10 pF. Example: B37940K2010**C**060
For other available capacitance tolerances see page 1

Ordering codes for C0G/NP0, 200 Vdc, Ni barrier terminations (cont´d)

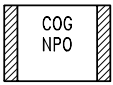
Size	0805/2012	1206/3216	1210/3225		
C_R	Ordering code[1)]				
	B37940	B37871	B37949		
1,0 nF		K2102J062 ◆	K2102J062 ❍		
1,2 nF					
1,5 nF			K2152J062 ◆		
1,8 nF					
2,2 nF			K2222J062 ●		

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

1) The tables contain the ordering codes for the standard capacitance tolerance:
C = ± 0,25 pF for < 10 pF; **J** = ± 5 % for ≥ 10 pF. Example: B37871K2102**J**062
For other available capacitance tolerances see page 1

Multilayer Chip Capacitors

C0G/NP0



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Ordering codes for C0G/NP0, 50 Vdc, Ni barrier terminations, bulk case packing

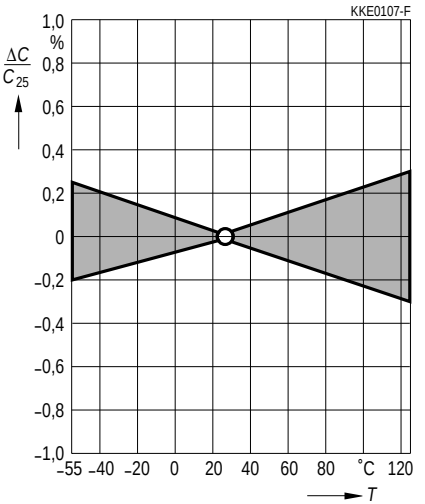
Size	0402/1005	0603/1608		
C_R[1]	Ordering code[2]			
	B37930	B37920		
1,0 pF	K5010C001 ▲	K5010C001 ❍		
1,2 pF		K5010C201 ❍		
1,5 pF		K5010C501 ❍		
1,8 pF		K5010C801 ❍		
2,2 *(2,0)* pF	*K5020C001* ▲	K5020C201 ❍		
2,7 *(3,0)* pF	*K5030C001* ▲	K5020C701 ❍		
3,3 *(4,0)* pF	*K5040C001* ▲	K5030C301 ❍		
3,9 *(5,0)* pF	*K5050C001* ▲	K5030C901 ❍		
4,7 *(6,0)* pF	*K5060C001* ▲	K5040C701 ❍		
5,6 *(7,0)* pF	*K5070C001* ▲	K5050C601 ❍		
6,8 *(8,0)* pF	*K5080C001* ▲	K5060C801 ❍		
8,2 *(9,0)* pF	*K5090C001* ▲	K5080C201 ❍		
10 pF	K5100J001 ▲	K5100J001 ❍		
12 pF	K5120J001 ▲	K5120J001 ❍		
15 pF	K5150J001 ▲	K5150J001 ❍		
18 pF	K5180J001 ▲	K5180J001 ❍		
22 pF	K5220J001 ▲	K5220J001 ❍		
27 pF	K5270J001 ▲	K5270J001 ❍		
33 pF	K5330J001 ▲	K5330J001 ❍		
39 pF	K5390J001 ▲	K5390J001 ❍		
47 pF	K5470J001 ▲	K5470J001 ❍		
56 pF	K5560J001 ▲	K5560J001 ❍		
68 pF	K5680J001 ▲	K5680J001 ❍		
82 pF	K5820J001 ▲	K5820J001 ❍		
100 pF	K5101J001 ▲	K5101J001 ❍		
120 pF	K5121J001 ▲	K5121J001 ❍		
150 pF	K5151J001 ▲	K5151J001 ❍		
180 pF	K5181J001 ▲	K5181J001 ❍		
220 pF	K5221J001 ▲	K5221J001 ❍		
270 pF		K5271J001 ❍		
330 pF		K5331J001 ❍		
390 pF		K5391J001 ❍		
470 pF		K5471J001 ❍		

Chip thickness: ❍: 0,8 ± 0,1 mm ▲: 10,5 ± 0,1 mm

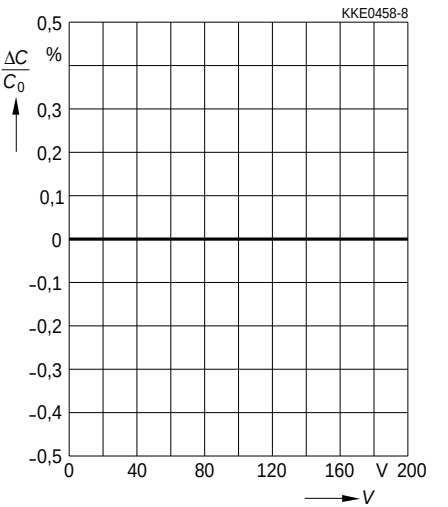
1) E12/E24 series available on request
2) The tables contain the ordering codes for the standard capacitance tolerance:
C = ± 0,25 pF for < 10 pF; J = ± 5 % for ≥ 10 pF. Example: B37930K5010**C**001
For other available capacitance tolerances see page 1

Characteristics (typical)

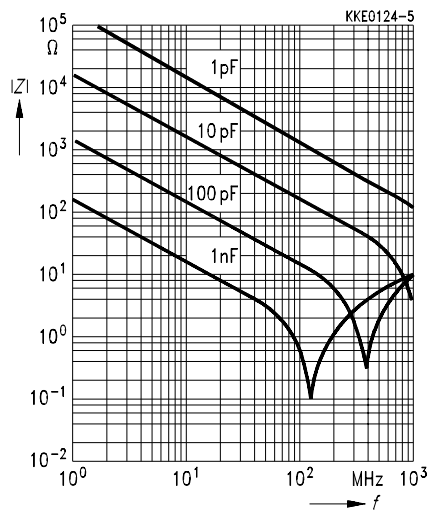
Capacitance change $\Delta C/C_{25}$ versus temperature T (tolerance range ▨)



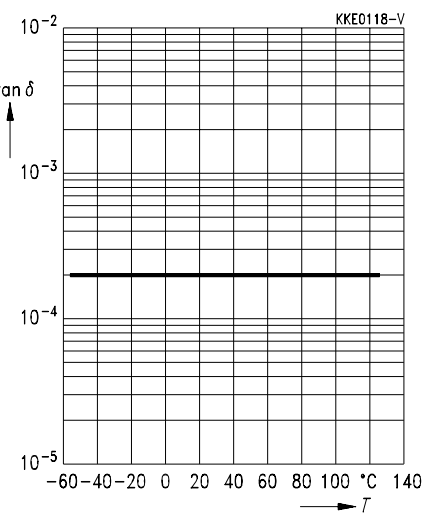
Capacitance change $\Delta C/C_0$ versus superimposed dc voltage V



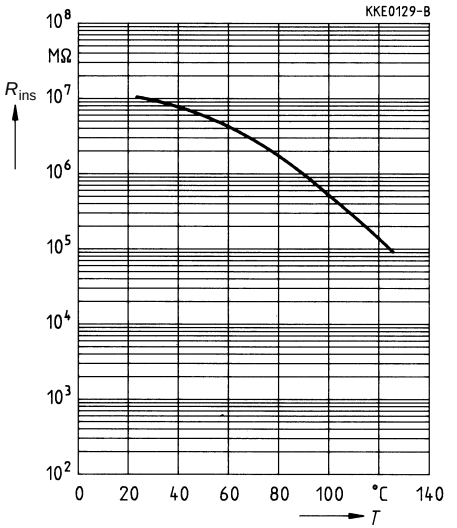
Impedance $|Z|$ versus frequency f



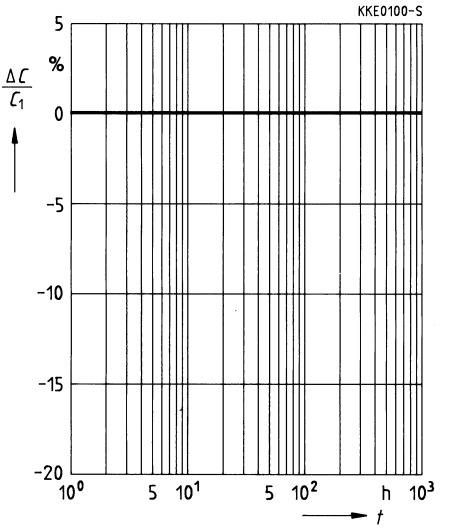
Dissipation factor tan δ versus temperature T



Insulation resistance R_{ins} versus temperature T

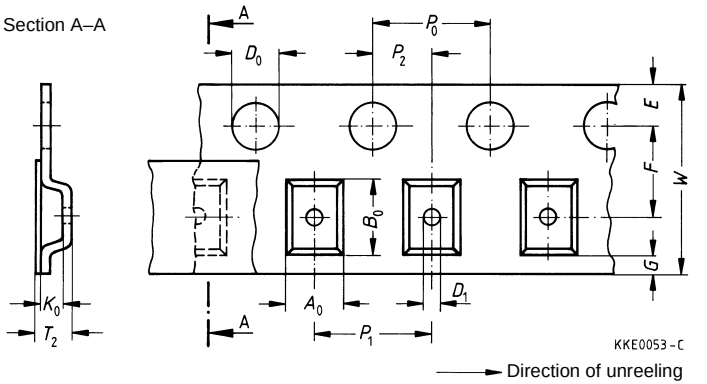


Capacitance change $\Delta C/C_1$ versus time t



1 Taping of chip capacitors

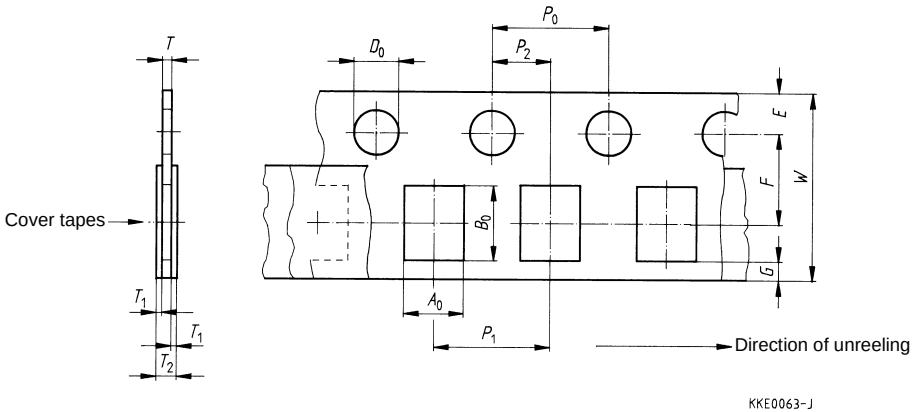
1.1 Blister tape (taping in accordance with IEC 60286-3)



Dimensions (mm)	Size (8-mm tape)			Tolerance
	0805/2012	1206/3216	1210/3225	
$A_0 \times B_0$	1,6 × 2,4	1,9 × 3,5	2,8 × 3,5	± 0,2
K_0	0,7 ; 0,9; 1,3 (standard)			max.
T_2	2,5			max.
D_0	1,5			+ 0,1/ – 0
D_1	1,0			min.
P_0	4,0			± 0,1[1)]
P_2	2,0			± 0,05
P_1	4,0			± 0,1
W	8,0			± 0,3
E	1,75			± 0,1
F	3,5			± 0,05
G	0,75			min.

1) ≤ 0,2 mm over 10 hole spaces

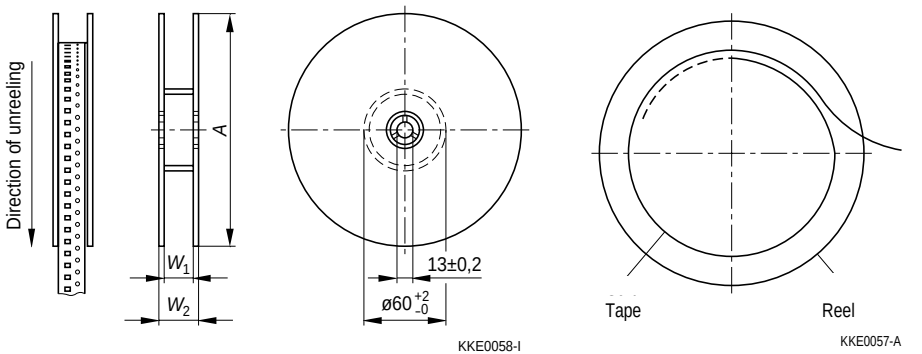
1.2 **Cardboard tape** (taping in accordance with IEC 60286-3)



Dimensions (mm)	Size (8-mm tape) 0402/1005	0603/1608	0805/2012	1206/3216	Tolerance
$A_0 \times B_0$	0,6 × 1,15	0,95 × 1,8	1,50 × 2,30	2,0 × 3,6	± 0,2
T	0,6	0,7; 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	2,0	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

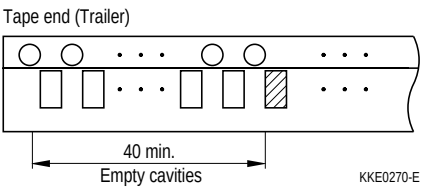


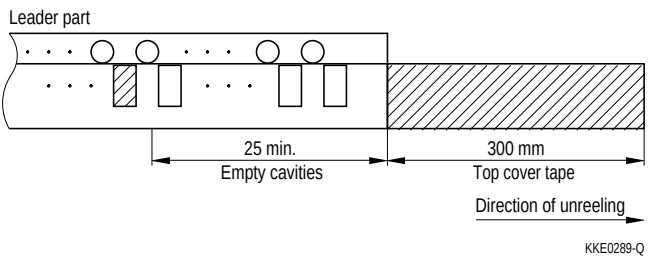
8-mm tape

Dimensions	180-mm tape reel	330-mm tape reel
A	180 – 3/+ 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

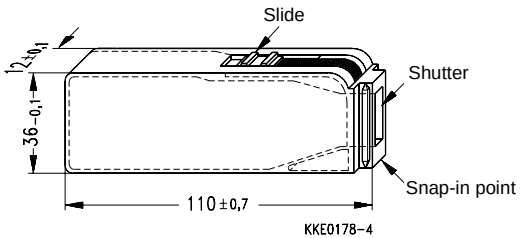
Dimensions	180-mm tape reel	330-mm tape reel
A	180 – 3/+ 0	330 ± 2,0
W_1	12,4 + 1,5/– 0	12,4 + 1,5/– 0
W_2	18,4 max.	18,4 max.





1.4 Bulk case packing

Part of our standard chip range is also available in bulk cases.



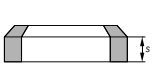
Packing units:

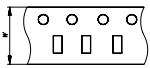
Chip size	pcs
0402	70000
0603	15000

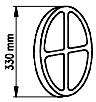
Advantages of bulk case packaging:

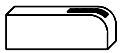
- Environmentally compatible material; considerably less packaging material (1/30 of blister packing)
- Small package sizes ($110 \times 36 \times 12$) mm with appropriately low storage requirements
- Can be used several times (less waste)
- No standstill-times during production, since packages can be 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 inch/mm	Thickness *s*	Tape		Packing units (in 1000 pcs)		
				Reel		Bulk case
		Cardboard Width *W*	Blister Width *W*	180 mm dia.	330 mm dia.	
0402/1005	0,5	8 mm	–	10,0	–	70,0
0603/1608	0,8	8 mm	–	4,0	16,0	15,0
0805/2012	0,6 0,8 1,2	8 mm 8 mm –	– – 8 mm	5,0 4,0 3,0	20,0 16,0 12,0	– – –
1206/3216	0,6 0,8 1,2	8 mm 8 mm –	– – 8 mm	4,0 4,0 3,0	16,0 16,0 12,0	– – –
1210/3225	0,6 0,8 1,2 1,6	– – – –	8 mm 8 mm 8 mm 8 mm	4,0 4,0 3,0 2,0	16,0 16,0 12,0 8,0	– – – –