Film Capacitors

Metallized Polyester Film Capacitors (MKT)

Series/Type: **B32520 ... B32529**

Date: October 2011

© EPCOS AG 2011. Reproduction, publication and dissemination of this publication, enclosures hereto and the information contained therein without EPCOS' prior express consent is prohibited.

Typical applications

- Blocking
- Coupling, decoupling
- Bypassing
- RFI for automotive

Climatic

- Max. operating temperature: 125 °C
- Climatic category (IEC 60068-1): 55/125/56

Construction

- Dielectric: polyethylene terephthalate (polyester, PET)
- Stacked-film technology for lead spacing 5 to 15 mm
  = code C, D or E in digit 7 of ordering code
- Wound capacitor technology for lead spacing 10 to 37.5 mm
  = code N, Q or R in digit 7 of ordering code
- Plastic case (UL 94 V-0)
- Epoxy resin sealing (UL 94 V-0)

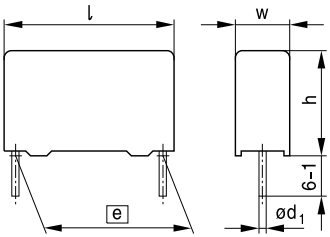
Features

- High pulse strength
- High contact reliability

Terminals

- Parallel wire leads, lead-free tinned
- Special lead lengths available on request

Dimensional drawing



KMK0835-P-E

Dimensions in mm

Lead spacing e ±0.4	Lead diameter d_1	Type
5.0	0.5	B32529
7.5	0.5	B32520
10.0	0.6[1)]	B32521
15.0	0.8	B32522
22.5	0.8	B32523
27.5	0.8	B32524
37.5	1.0	B32526

1) 0.5 mm for capacitor width w = 4 mm

Marking

Manufacturer's logo,
rated capacitance (coded), cap. tolerance (code letter),
rated DC voltage, date of manufacture (coded),
coded type ("1") for lead spacing 5 mm,
series and lot number for lead spacing ≥10 mm

Delivery mode

Bulk (untaped)
Taped (Ammo pack or reel)
For notes on taping, refer to chapter "Taping and packing".

Overview of available types

Lead spacing	5.0 mm					7.5 mm				10.0 mm				
Type	B32529					B32520				B32521				
Page	6					10				12				
Technology	s	s	s	s	s	s	s	s	s	s	s	s	s	s
V_R (V DC)	63	100	250	400	630	63	100	250	400	63	100	250	400	630
V_{RMS} (V AC)	40	63	160	200	400	40	63	160	200	40	63	160	200	200
C_R (µF)														
0.0010														
0.0015														
0.0022														
0.0033														
0.0047														
0.0068														
0.010														
0.015														
0.022														
0.033														
0.047														
0.068														
0.10														
0.15														
0.22														
0.33														
0.47														
0.68														
1.0														
1.5														
2.2														
3.3														
4.7														

Technology: s = Stacked-film technology / w = Wound capacitor technology

Overview of available types

Lead spacing	15.0 mm						22.5 mm					27.5 mm				
Type	B32522						B32523					B32524				
Page	14						17					18				
Technology	s	s/w	s/w	s	w	s	w	w	w	w	w	w	w	w	w	w
V_R (V DC)	63	100	250	400	450	630	63	100	250	400	630	63	100	250	400	630
V_{RMS} (V AC)	40	63	160	200	200	200	40	63	160	200	200	40	63	160	200	220
C_R (µF)																
0.047				■		■										
0.068				■		■										
0.10			■	■	■	■					■					
0.15			■	■	■	■					■					
0.22			■	■	■	■				■	■					
0.33		■	■	■	■					■	■					■
0.47		■	■	■	■				■	■	■					■
0.68	■	■	■	■	■				■	■	■				■	■
1.0	■	■	■		■				■	■					■	■
1.5	■	■	■					■	■	■				■	■	■
2.2	■	■						■	■					■	■	■
3.3	■	■					■	■	■					■	■	
4.7	■	■					■	■				■	■	■	■	
6.8	■						■	■				■	■	■	■	
10	■						■	■				■	■	■	■	
15							■	■				■	■	■		
22							■					■	■	■		
33												■	■	■		
47												■	■			
68												■	■			
100												■				

Technology: s = Stacked-film technology / w = Wound capacitor technology

Overview of available types

Lead spacing	37.5 mm			
Type	B32526			
Page	20			
Technology	w	w	w	w
V_R (V DC)	63	100	250	400
V_{RMS} (V AC)	40	63	160	200
C_R (µF)	NEW	NEW	NEW	NEW
3.3				
4.7				
5.6				
6.8				
8.2				
10				
15				
22				
33				
47				
56				
68				
82				
100				
150				
220				

Technology: s = Stacked-film technology / w = Wound capacitor technology

Ordering codes and packing units (lead spacing 5 mm)

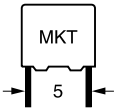
V_R V DC	V_{RMS} f ≤60 Hz V AC	C_R µF	Max. dimensions w × h × l mm	Ordering code (composition see below)	Ammo pack pcs./MOQ	Reel pcs./ MOQ	Untaped pcs./ MOQ
63	40	0.0010	2.5 × 6.5 × 7.2	B32529C0102+***	12800	11200	8000
		0.0015	2.5 × 6.5 × 7.2	B32529C0152+***	12800	11200	8000
		0.0022	2.5 × 6.5 × 7.2	B32529C0222+***	12800	11200	8000
		0.0033	2.5 × 6.5 × 7.2	B32529C0332+***	12800	11200	8000
		0.0047	2.5 × 6.5 × 7.2	B32529C0472+***	12800	11200	8000
		0.0068	2.5 × 6.5 × 7.2	B32529C0682+***	12800	11200	8000
		0.010	2.5 × 6.5 × 7.2	B32529C0103+***	12800	11200	8000
		0.015	2.5 × 6.5 × 7.2	B32529C0153+***	12800	11200	8000
		0.022	2.5 × 6.5 × 7.2	B32529C0223+***	12800	11200	8000
		0.033	2.5 × 6.5 × 7.2	B32529C0333+***	12800	11200	8000
		0.047	2.5 × 6.5 × 7.2	B32529C0473+***	12800	11200	8000
		0.068	2.5 × 6.5 × 7.2	B32529C0683+***	12800	11200	8000
		0.10	2.5 × 6.5 × 7.2	B32529C0104+***	12800	11200	8000
		0.15	2.5 × 6.5 × 7.2	B32529C0154+***	12800	11200	8000
		0.22	2.5 × 6.5 × 7.2	B32529C0224+***	12800	11200	8000
		0.33	3.0 × 6.5 × 7.2	B32529C0334+***	10800	9600	8000
		0.47	3.5 × 8.0 × 7.2	B32529C0474+***	9200	8000	8000
		0.68	4.5 × 9.5 × 7.3	B32529C0684+***	7200	6000	6000
		1.0	4.5 × 9.5 × 7.3	B32529C0105+***	7200	6000	6000
		1.5	6.0 × 10.5 × 7.5	B32529C0155+***	5200	4400	4000
		2.2	7.8 × 13.0 × 7.8	B32529D0225+***	4000	3200	4000
		3.3	7.8 × 13.0 × 7.8	B32529D0335+***	4000	3200	4000
		4.7	7.8 × 13.0 × 7.8	B32529D0475M***	4000	3200	4000

MOQ = Minimum Order Quantity, consisting of 4 packing units.
Further E series and intermediate capacitance values on request.

Composition of ordering code

+ = Capacitance tolerance code:
- M = ±20%
- K = ±10%
- J = ±5%

*** = Packaging code:
- 289 = Ammo pack
- 189 = Reel
- 000 = Untaped (lead length 6 −1 mm)



Ordering codes and packing units (lead spacing 5 mm)

V_R V DC	V_{RMS} f ≤60 Hz V AC	C_R µF	Max. dimensions w × h × l mm	Ordering code (composition see below)	Ammo pack pcs./MOQ	Reel pcs./ MOQ	Untaped pcs./ MOQ
100	63	0.0010	2.5 × 6.5 × 7.2	B32529C1102+***	12800	11200	8000
		0.0015	2.5 × 6.5 × 7.2	B32529C1152+***	12800	11200	8000
		0.0022	2.5 × 6.5 × 7.2	B32529C1222+***	12800	11200	8000
		0.0033	2.5 × 6.5 × 7.2	B32529C1332+***	12800	11200	8000
		0.0047	2.5 × 6.5 × 7.2	B32529C1472+***	12800	11200	8000
		0.0068	2.5 × 6.5 × 7.2	B32529C1682+***	12800	11200	8000
		0.010	2.5 × 6.5 × 7.2	B32529C1103+***	12800	11200	8000
		0.015	2.5 × 6.5 × 7.2	B32529C1153+***	12800	11200	8000
		0.022	2.5 × 6.5 × 7.2	B32529C1223+***	12800	11200	8000
		0.033	2.5 × 6.5 × 7.2	B32529C1333+***	12800	11200	8000
		0.047	2.5 × 6.5 × 7.2	B32529C1473+***	12800	11200	8000
		0.068	2.5 × 6.5 × 7.2	B32529C1683+***	12800	11200	8000
		0.10	2.5 × 6.5 × 7.2	B32529C1104+***	12800	11200	8000
		0.15	3.0 × 6.5 × 7.2	B32529C1154+***	10800	9600	8000
		0.22	3.5 × 8.0 × 7.2	B32529C1224+***	9200	8000	8000
		0.33	3.5 × 8.0 × 7.2	B32529C1334+***	9200	8000	8000
		0.47	4.5 × 9.5 × 7.3	B32529C1474+***	7200	6000	6000
		0.68	6.0 × 10.5 × 7.5	B32529C1684+***	5200	4400	4000
		1.0	7.8 × 13.0 × 7.8	B32529D1105+***	4000	3200	4000

MOQ = Minimum Order Quantity, consisting of 4 packing units.
Further E series and intermediate capacitance values on request.

Composition of ordering code

+ = Capacitance tolerance code:
- M = ±20%
- K = ±10%
- J = ±5%

*** = Packaging code:
- 289 = Ammo pack
- 189 = Reel
- 000 = Untaped (lead length 6 −1 mm)

Ordering codes and packing units (lead spacing 5 mm)

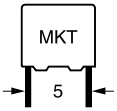
V_R V DC	V_{RMS} f ≤60 Hz V AC	C_R µF	Max. dimensions w × h × l mm	Ordering code (composition see below)	Ammo pack pcs./MOQ	Reel pcs./ MOQ	Untaped pcs./ MOQ
250	160	0.0010	2.5 × 6.5 × 7.2	B32529C3102+***	12800	11200	8000
		0.0015	2.5 × 6.5 × 7.2	B32529C3152+***	12800	11200	8000
		0.0022	2.5 × 6.5 × 7.2	B32529C3222+***	12800	11200	8000
		0.0033	2.5 × 6.5 × 7.2	B32529C3332+***	12800	11200	8000
		0.0047	2.5 × 6.5 × 7.2	B32529C3472+***	12800	11200	8000
		0.0068	2.5 × 6.5 × 7.2	B32529C3682+***	12800	11200	8000
		0.010	2.5 × 6.5 × 7.2	B32529C3103+***	12800	11200	8000
		0.015	2.5 × 6.5 × 7.2	B32529C3153+***	12800	11200	8000
		0.022	2.5 × 6.5 × 7.2	B32529C3223+***	12800	11200	8000
		0.033	3.0 × 6.5 × 7.2	B32529C3333+***	10800	9600	8000
		0.047	3.5 × 8.0 × 7.2	B32529C3473+***	9200	8000	8000
		0.068	4.5 × 9.5 × 7.3	B32529C3683+***	7200	6000	6000
		0.10	4.5 × 9.5 × 7.3	B32529C3104+***	7200	6000	6000
		0.15	5.0 × 10.0 × 7.5	B32529C3154+***	6400	5600	6000
		0.22	7.8 × 13.0 × 7.8	B32529D3224+***	4000	3200	4000
		0.33	7.8 × 13.0 × 7.8	B32529C3334+***	4000	3200	4000
		0.47	7.8 × 13.0 × 7.8	B32529C3474+***	4000	3200	4000

MOQ = Minimum Order Quantity, consisting of 4 packing units.
Further E series and intermediate capacitance values on request.

Composition of ordering code

+ = Capacitance tolerance code:
- M = ±20%
- K = ±10%
- J = ±5%

*** = Packaging code:
- 289 = Ammo pack
- 189 = Reel
- 000 = Untaped (lead length 6 −1 mm)



Ordering codes and packing units (lead spacing 5 mm)

V_R V DC	V_{RMS} f ≤60 Hz V AC	C_R µF	Max. dimensions w × h × l mm	Ordering code (composition see below)	Ammo pack pcs./MOQ	Reel pcs./ MOQ	Untaped pcs./ MOQ
400	200	0.0010	2.5 × 6.5 × 7.2	B32529C6102+***	12800	11200	8000
		0.0015	2.5 × 6.5 × 7.2	B32529C6152+***	12800	11200	8000
		0.0022	2.5 × 6.5 × 7.2	B32529C6222+***	12800	11200	8000
		0.0033	2.5 × 6.5 × 7.2	B32529C6332+***	12800	11200	8000
		0.0047	2.5 × 6.5 × 7.2	B32529C6472+***	12800	11200	8000
		0.0068	2.5 × 6.5 × 7.2	B32529C6682+***	12800	11200	8000
		0.010	3.0 × 6.5 × 7.2	B32529E6103+***	10800	9600	8000
		0.015	3.0 × 6.5 × 7.2	B32529E6153+***	10800	9600	8000
		0.022	3.5 × 8.0 × 7.2	B32529E6223+***	9200	8000	8000
		0.033	4.5 × 9.5 × 7.3	B32529E6333+***	7200	6000	6000
		0.047	4.5 × 9.5 × 7.3	B32529E6473+***	7200	6000	6000
		0.068	6.0 × 10.5 × 7.5	B32529E6683+***	5200	4400	4000
		0.10	7.8 × 13.0 × 7.8	B32529E6104+***	4000	3200	4000
		0.15	7.8 × 13.0 × 7.8	B32529E6154+***	4000	3200	4000
630	400	0.0010	2.5 × 6.5 × 7.2	B32529C8102+***	12800	11200	8000
		0.0015	2.5 × 6.5 × 7.2	B32529C8152+***	12800	11200	8000
		0.0022	2.5 × 6.5 × 7.2	B32529C8222+***	12800	11200	8000
		0.0033	3.5 × 8.0 × 7.2	B32529C8332+***	9200	8000	8000
		0.0047	3.5 × 8.0 × 7.2	B32529C8472+***	9200	8000	8000
		0.0068	3.5 × 8.0 × 7.2	B32529C8682+***	9200	8000	8000
		0.010	5.0 × 10.0 × 7.5	B32529C8103+***	6400	5600	6000
		0.015	5.0 × 10.0 × 7.5	B32529C8153+***	6400	5600	6000
		0.022	7.8 × 13.0 × 7.8	B32529C8223+***	5200	4400	4000
		0.033	7.8 × 13.0 × 7.8	B32529C8333+***	4000	3200	4000

MOQ = Minimum Order Quantity, consisting of 4 packing units.
Further E series and intermediate capacitance values on request.

Composition of ordering code

+ = Capacitance tolerance code:
M = ±20%
K = ±10%
J = ±5%

*** = Packaging code:
289 = Ammo pack
189 = Reel
000 = Untaped (lead length 6 −1 mm)

Ordering codes and packing units (lead spacing 7.5 mm)

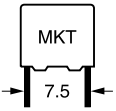
V_R V DC	V_{RMS} f ≤60 Hz V AC	C_R µF	Max. dimensions w × h × l mm	Ordering code (composition see below)	Ammo pack pcs./MOQ	Reel pcs./ MOQ	Untaped pcs./ MOQ
63	40	0.068	2.5 × 7.0 × 10.0	B32520C0683+***	12800	11200	10000
		0.10	2.5 × 7.0 × 10.0	B32520C0104+***	12800	11200	10000
		0.15	2.5 × 7.0 × 10.0	B32520C0154+***	12800	11200	10000
		0.22	2.5 × 7.0 × 10.0	B32520C0224+***	12800	11200	10000
		0.33	2.5 × 7.0 × 10.0	B32520C0334+***	12800	11200	10000
		0.47	3.0 × 8.0 × 10.0	B32520C0474+***	10400	9600	8000
		0.68	4.0 × 8.5 × 10.0	B32520C0684+***	8000	7200	6000
		1.0	5.0 × 10.5 × 10.0	B32520C0105+***	6400	5600	4000
		1.5	5.0 × 10.5 × 10.0	B32520C0155+***	6400	5600	4000
		2.2	6.0 × 12.0 × 10.3	B32520C0225+***	5200	4400	3000
100	63	0.047	2.5 × 7.0 × 10.0	B32520C1473+***	12800	11200	10000
		0.068	2.5 × 7.0 × 10.0	B32520C1683+***	12800	11200	10000
		0.10	2.5 × 7.0 × 10.0	B32520C1104+***	12800	11200	10000
		0.15	3.0 × 8.0 × 10.0	B32520C1154+***	10400	9600	8000
		0.22	3.0 × 8.0 × 10.0	B32520C1224+***	10400	9600	8000
		0.33	4.0 × 8.5 × 10.0	B32520C1334+***	8000	7200	6000
		0.47	5.0 × 10.5 × 10.0	B32520C1474+***	6400	5600	4000
		0.68	6.0 × 12.0 × 10.3	B32520C1684+***	5200	4400	3000
		1.0	6.0 × 12.0 × 10.3	B32520C1105+***	5200	4400	3000
250	160	0.015	2.5 × 7.0 × 10.0	B32520C3153+***	12800	11200	10000
		0.022	2.5 × 7.0 × 10.0	B32520C3223+***	12800	11200	10000
		0.033	2.5 × 7.0 × 10.0	B32520C3333+***	12800	11200	10000
		0.047	2.5 × 7.0 × 10.0	B32520C3473+***	12800	11200	10000
		0.068	3.0 × 8.0 × 10.0	B32520C3683+***	10400	9600	8000
		0.10	4.0 × 8.5 × 10.0	B32520C3104+***	8000	7200	6000
		0.15	5.0 × 10.5 × 10.0	B32520C3154+***	6400	5600	4000
		0.22	6.0 × 12.0 × 10.3	B32520C3224+***	5200	4400	3000

MOQ = Minimum Order Quantity, consisting of 4 packing units.
Further E series and intermediate capacitance values on request.

Composition of ordering code

+ = Capacitance tolerance code:
- M = ±20%
- K = ±10%
- J = ±5%

*** = Packaging code:
- 289 = Ammo pack
- 189 = Reel
- 000 = Untaped (lead length 6 −1 mm)



Ordering codes and packing units (lead spacing 7.5 mm)

V_R V DC	V_{RMS} f ≤60 Hz V AC	C_R µF	Max. dimensions w × h × l mm	Ordering code (composition see below)	Ammo pack pcs./MOQ	Reel pcs./ MOQ	Untaped pcs./ MOQ
400	200	0.0010	2.5 × 7.0 × 10.0	B32520C6102+***	12800	11200	10000
		0.0015	2.5 × 7.0 × 10.0	B32520C6152+***	12800	11200	10000
		0.0022	2.5 × 7.0 × 10.0	B32520C6222+***	12800	11200	10000
		0.0033	2.5 × 7.0 × 10.0	B32520C6332+***	12800	11200	10000
		0.0047	2.5 × 7.0 × 10.0	B32520C6472+***	12800	11200	10000
		0.0068	2.5 × 7.0 × 10.0	B32520C6682+***	12800	11200	10000
		0.010	2.5 × 7.0 × 10.0	B32520C6103+***	12800	11200	10000
		0.015	3.0 × 8.0 × 10.0	B32520E6153+***	10400	9600	8000
		0.022	3.0 × 8.0 × 10.0	B32520E6223+***	10400	9600	8000
		0.033	4.0 × 8.5 × 10.0	B32520E6333+***	8000	7200	6000
		0.047	4.0 × 8.5 × 10.0	B32520E6473+***	8000	7200	6000
		0.068	5.0 × 10.5 × 10.0	B32520E6683+***	6400	5600	4000
		0.10	5.0 × 10.5 × 10.0	B32520E6104+***	6400	5600	4000
		0.15	6.0 × 12.0 × 10.3	B32520E6154+***	5200	4400	3000

MOQ = Minimum Order Quantity, consisting of 4 packing units.
Further E series and intermediate capacitance values on request.

Composition of ordering code

+ = Capacitance tolerance code:
- M = ±20%
- K = ±10%
- J = ±5%

*** = Packaging code:
- 289 = Ammo pack
- 189 = Reel
- 000 = Untaped (lead length 6 −1 mm)

Ordering codes and packing units (lead spacing 10 mm)

V_R V DC	V_{RMS} f ≤60 Hz V AC	C_R µF	Max. dimensions w × h × l mm	Ordering code (composition see below)	Ammo pack pcs./MOQ	Reel pcs./ MOQ	Untaped pcs./ MOQ
63	40	0.47	4.0 × 7.0 × 13.0	B32521C0474+***	4000	6800	4000
		0.68	4.0 × 7.0 × 13.0	B32521C0684+***	4000	6800	4000
		1.0	4.0 × 9.0 × 13.0	B32521C0105+***	4000	6800	4000
		1.5	5.0 × 11.0 × 13.0	B32521C0155+***	3320	5200	4000
		2.2	5.0 × 11.0 × 13.0	B32521C0225+***	3320	5200	4000
		3.3	6.0 × 12.0 × 13.0	B32521C0335+***	2720	4400	4000
100	63	0.10	4.0 × 7.0 × 13.0	B32521C1104+***	4000	6800	4000
		0.15	4.0 × 7.0 × 13.0	B32521C1154+***	4000	6800	4000
		0.22	4.0 × 7.0 × 13.0	B32521C1224+***	4000	6800	4000
		0.33	4.0 × 7.0 × 13.0	B32521C1334+***	4000	6800	4000
		0.47	4.0 × 9.0 × 13.0	B32521C1474+***	4000	6800	4000
		0.68	5.0 × 11.0 × 13.0	B32521C1684+***	3320	5200	4000
		1.0	6.0 × 12.0 × 13.0	B32521C1105+***	2720	4400	4000
250	160	0.033	4.0 × 7.0 × 13.0	B32521C3333+***	4000	6800	4000
		0.047	4.0 × 7.0 × 13.0	B32521C3473+***	4000	6800	4000
		0.068	4.0 × 7.0 × 13.0	B32521C3683+***	4000	6800	4000
		0.10	4.0 × 7.0 × 13.0	B32521C3104+***	4000	6800	4000
		0.15	4.0 × 9.0 × 13.0	B32521C3154+***	4000	6800	4000
		0.22	5.0 × 11.0 × 13.0	B32521C3224+***	3320	5200	4000
		0.33	5.0 × 11.0 × 13.0	B32521C3334+***	3320	5200	4000
		0.47	6.0 × 12.0 × 13.0	B32521C3474+***	2720	4400	4000
400	200	0.010	4.0 × 7.0 × 13.0	B32521E6103+***	4000	6800	4000
		0.015	4.0 × 7.0 × 13.0	B32521E6153+***	4000	6800	4000
		0.022	4.0 × 7.0 × 13.0	B32521E6223+***	4000	6800	4000
		0.033	4.0 × 7.0 × 13.0	B32521E6333+***	4000	6800	4000
		0.047	4.0 × 9.0 × 13.0	B32521E6473+***	4000	6800	4000
		0.068	4.0 × 9.0 × 13.0	B32521E6683+***	4000	6800	4000
		0.10	5.0 × 11.0 × 13.0	B32521E6104+***	3320	5200	4000
		0.15	6.0 × 12.0 × 13.0	B32521E6154+***	2720	4400	4000

MOQ = Minimum Order Quantity, consisting of 4 packing units.
Further E series and intermediate capacitance values on request.

Composition of ordering code

+ = Capacitance tolerance code:
- M = ±20%
- K = ±10%
- J = ±5%

*** = Packaging code:
- 289 = Ammo pack
- 189 = Reel
- 000 = Untaped (lead length 6 −1 mm)

Ordering codes and packing units (lead spacing 10 mm)

V_R V DC	V_{RMS} f ≤60 Hz V AC	C_R µF	Max. dimensions w × h × l mm	Ordering code (composition see below)	Ammo pack pcs./MOQ	Reel pcs./ MOQ	Untaped pcs./ MOQ
630	200	0.010	4.0 × 9.0 × 13.0	B32521D8103+***	–	6800	4000
		0.015	5.0 × 11.0 × 13.0	B32521D8153+***	–	6800	4000
		0.022	5.0 × 11.0 × 13.0	B32521D8223+***	–	5200	4000
		0.033	6.0 × 12.0 × 13.0	B32521D8333+***	–	5200	4000

MOQ = Minimum Order Quantity, consisting of 4 packing units.
Further E series and intermediate capacitance values on request.

Composition of ordering code

+ = Capacitance tolerance code:
M = ±20%
K = ±10%
J = ±5%

*** = Packaging code:
289 = Ammo pack
189 = Reel
000 = Untaped (lead length 6 −1 mm)

Ordering codes and packing units (lead spacing 15 mm)

V_R V DC	V_{RMS} f ≤60 Hz V AC	C_R µF	Max. dimensions w × h × l mm	Ordering code (composition see below)	Ammo pack pcs./MOQ	Reel pcs./ MOQ	Untaped pcs./ MOQ
63	40	0.68	5.0 × 10.5 × 18.0	B32522C0684+***	4680	5200	4000
		1.0	5.0 × 10.5 × 18.0	B32522C0105+***	4680	5200	4000
		1.5	5.0 × 10.5 × 18.0	B32522C0155+***	4680	5200	4000
		2.2	5.0 × 10.5 × 18.0	B32522C0225+***	4680	5200	4000
		3.3	6.0 × 11.0 × 18.0	B32522C0335+***	3840	4400	4000
		4.7	7.0 × 12.5 × 18.0	B32522C0475+***	3320	3600	4000
		6.8	8.5 × 14.5 × 18.0	B32522C0685+***	2720	2800	2000
		10	9.0 × 17.5 × 18.0	B32522C0106+***	2560	2800	2000
100	63	0.33	5.0 × 10.5 × 18.0	B32522C1334+***	4680	5200	4000
		0.47	5.0 × 10.5 × 18.0	B32522C1474+***	4680	5200	4000
		0.68	5.0 × 10.5 × 18.0	B32522C1684+***	4680	5200	4000
		1.0	5.0 × 10.5 × 18.0	B32522C1105+***	4680	5200	4000
		1.0 ∇	6.0 × 11.0 × 18.0	B32522Q1105+***	3840	4400	4000
		1.5	6.0 × 11.0 × 18.0	B32522C1155+***	3840	4400	4000
		1.5 ∇	7.0 × 12.5 × 18.0	B32522Q1155+***	3320	3600	4000
		2.2	7.0 × 12.5 × 18.0	B32522C1225+***	3320	3600	4000
		2.2 ∇	8.5 × 14.5 × 18.0	B32522Q1225+***	2720	2800	2000
		3.3	8.5 × 14.5 × 18.0	B32522C1335+***	2720	2800	2000
		3.3 ∇	9.0 × 17.5 × 18.0	B32522Q1335+***	2560	2800	2000
		4.7	9.0 × 17.5 × 18.0	B32522C1475+***	2560	2800	2000
		4.7 ∇	11.0 × 18.5 × 18.0	B32522Q1475+***	–	2200	1200

∇ Wound capacitor technology

MOQ = Minimum Order Quantity, consisting of 4 packing units.
Further E series and intermediate capacitance values on request.

Composition of ordering code

+ = Capacitance tolerance code:
- M = ±20%
- K = ±10%
- J = ±5%

*** = Packaging code:
- 289 = Ammo pack
- 189 = Reel
- 000 = Untaped (lead length 6 −1 mm)

Ordering codes and packing units (lead spacing 15 mm)

V_R V DC	V_{RMS} f ≤60 Hz V AC	C_R µF	Max. dimensions w × h × l mm	Ordering code (composition see below)	Ammo pack pcs./MOQ	Reel pcs./ MOQ	Untaped pcs./ MOQ
250	160	0.10	5.0 × 10.5 × 18.0	B32522C3104+***	4680	5200	4000
		0.15	5.0 × 10.5 × 18.0	B32522C3154+***	4680	5200	4000
		0.22	5.0 × 10.5 × 18.0	B32522C3224+***	4680	5200	4000
		0.33	5.0 × 10.5 × 18.0	B32522C3334+***	4680	5200	4000
		0.47	6.0 × 11.0 × 18.0	B32522C3474+***	3840	4400	4000
		0.68	7.0 × 12.5 × 18.0	B32522C3684+***	3320	3600	4000
		1.0	8.5 × 14.5 × 18.0	B32522C3105+***	2720	2800	2000
		1.0 ∇	8.5 × 14.5 × 18.0	B32522N3105+***	2720	2800	2000
		1.5	9.0 × 17.5 × 18.0	B32522C3155+***	2560	2800	2000
		1.5 ∇	9.0 × 17.5 × 18.0	B32522N3155+***	2560	2800	2000
400	200	0.047	5.0 × 10.5 × 18.0	B32522E6473+***	4680	5200	4000
		0.068	5.0 × 10.5 × 18.0	B32522E6683+***	4680	5200	4000
		0.10	5.0 × 10.5 × 18.0	B32522E6104+***	4680	5200	4000
		0.15	5.0 × 10.5 × 18.0	B32522E6154+***	4680	5200	4000
		0.22	6.0 × 11.0 × 18.0	B32522E6224+***	3840	4400	4000
		0.33	7.0 × 12.5 × 18.0	B32522E6334+***	3320	3600	4000
		0.47	9.0 × 17.5 × 18.0	B32522E6474+***	2560	2800	2000
		0.68	9.0 × 17.5 × 18.0	B32522E6684+***	2560	2800	2000
450	200	0.10 ∇	5.0 × 10.5 × 18.0	B32522N6104+***	4680	5200	4000
		0.15 ∇	5.0 × 10.5 × 18.0	B32522N6154+***	4680	5200	4000
		0.22 ∇	6.0 × 11.0 × 18.0	B32522N6224+***	3840	4400	4000
		0.33 ∇	7.0 × 12.5 × 18.0	B32522N6334+***	3320	3600	4000
		0.47 ∇	8.5 × 14.5 × 18.0	B32522N6474+***	2720	2800	2000
		0.68 ∇	9.0 × 17.5 × 18.0	B32522N6684+***	2560	2800	2000
		1.0 ∇	11.0 × 18.5 × 18.0	B32522N6105+***	–	2200	1200

∇ Wound capacitor technology

MOQ = Minimum Order Quantity, consisting of 4 packing units.
Further E series and intermediate capacitance values on request.

Composition of ordering code

+ = Capacitance tolerance code:
- M = ±20%
- K = ±10%
- J = ±5%

*** = Packaging code:
- 289 = Ammo pack
- 189 = Reel
- 000 = Untaped (lead length 6 −1 mm)

Ordering codes and packing units (lead spacing 15 mm)

V_R V DC	V_{RMS} f ≤60 Hz V AC	C_R µF	Max. dimensions w × h × l mm	Ordering code (composition see below)	Ammo pack pcs./MOQ	Reel pcs./ MOQ	Untaped pcs./ MOQ
630	200	0.047	5.0 × 10.5 × 18.0	B32522D8473+***	–	5200	4000
		0.068	6.0 × 11.0 × 18.0	B32522D8683+***	–	4400	4000
		0.10	7.0 × 12.5 × 18.0	B32522D8104+***	–	3600	4000
		0.15	8.5 × 14.5 × 18.0	B32522D8154+***	–	2800	2000
		0.22	9.0 × 17.5 × 18.0	B32522D8224+***	–	2800	2000

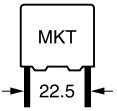
∇ Wound capacitor technology

MOQ = Minimum Order Quantity, consisting of 4 packing units.
Further E series and intermediate capacitance values on request.

Composition of ordering code

+ = Capacitance tolerance code:
M = ±20%
K = ±10%
J = ±5%

*** = Packaging code:
289 = Ammo pack
189 = Reel
000 = Untaped (lead length 6 −1 mm)



Ordering codes and packing units (lead spacing 22.5 mm)

V_R V DC	V_{RMS} f ≤60 Hz V AC	C_R µF	Max. dimensions w × h × l mm	Ordering code (composition see below)	Ammo pack pcs./MOQ	Reel pcs./MOQ	Untaped pcs./MOQ
63	40	3.3	6.0 × 15.0 × 26.5	B32523R0335+***	2720	2800	2880
		4.7	6.0 × 15.0 × 26.5	B32523R0475+***	2720	2800	2880
		6.8	6.0 × 15.0 × 26.5	B32523R0685+***	2720	2800	2880
		10	7.0 × 16.0 × 26.5	B32523R0106+***	2320	2400	2520
		15	10.5 × 16.5 × 26.5	B32523R0156+***	1560	1600	2160
		22	12.0 × 22.0 × 26.5	B32523R0226+***	–	–	1800
100	63	1.5	6.0 × 15.0 × 26.5	B32523Q1155+***	2720	2800	2880
		2.2	6.0 × 15.0 × 26.5	B32523Q1225+***	2720	2800	2880
		3.3	6.0 × 15.0 × 26.5	B32523Q1335+***	2720	2800	2880
		4.7	7.0 × 16.0 × 26.5	B32523Q1475+***	2320	2400	2540
		6.8	8.5 × 16.5 × 26.5	B32523Q1685+***	1960	2000	2040
		10	10.5 × 16.5 × 26.5	B32523Q1106+***	1560	1600	2160
		15	12.0 × 22.0 × 26.5	B32523Q1156+***	–	–	1800
250	160	0.47	6.0 × 15.0 × 26.5	B32523Q3474+***	2720	2800	2880
		0.68	6.0 × 15.0 × 26.5	B32523Q3684+***	2720	2800	2880
		1.0	6.0 × 15.0 × 26.5	B32523Q3105+***	2720	2800	2880
		1.5	7.0 × 16.0 × 26.5	B32523Q3155+***	2320	2400	2520
		2.2	10.5 × 16.5 × 26.5	B32523Q3225+***	1560	1600	2160
		3.3	11.0 × 20.5 × 26.5	B32523Q3335+***	1480	1400	2040
400	200	0.22	6.0 × 15.0 × 26.5	B32523Q6224+***	2720	2800	2880
		0.33	6.0 × 15.0 × 26.5	B32523Q6334+***	2720	2800	2880
		0.47	7.0 × 16.0 × 26.5	B32523Q6474+***	2320	2400	2520
		0.68	8.5 × 16.5 × 26.5	B32523Q6684+***	1920	2000	2040
		1.0	10.5 × 16.5 × 26.5	B32523Q6105+***	1560	1600	2160
		1.5	11.0 × 20.5 × 26.5	B32523Q6155+***	1480	1400	2040
630	200	0.10	6.0 × 15.0 × 26.5	B32523Q8104+***	2720	2800	2880
		0.15	6.0 × 15.0 × 26.5	B32523Q8154+***	2720	2800	2880
		0.22	7.0 × 16.0 × 26.5	B32523Q8224+***	2320	2400	2520
		0.33	10.5 × 16.5 × 26.5	B32523Q8334+***	1560	1600	2160
		0.47	10.5 × 20.5 × 26.5	B32523Q8474+***	1560	1600	2160
		0.68	12.0 × 22.0 × 26.5	B32523Q8684+***	–	–	1800

MOQ = Minimum Order Quantity, consisting of 4 packing units.
Further E series and intermediate capacitance values on request.

Composition of ordering code

+ = Capacitance tolerance code:
- M = ±20%
- K = ±10%
- J = ±5%

*** = Packaging code:
- 289 = Ammo pack
- 189 = Reel
- 000 = Untaped (lead length 6 −1 mm)

Ordering codes and packing units (lead spacing 27.5 mm)

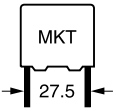
V_R V DC	V_{RMS} f ≤60 Hz V AC	C_R µF	Max. dimensions w × h × l mm	Ordering code (composition see below)	Ammo pack pcs./MOQ	Reel pcs./MOQ	Untaped pcs./MOQ
63	40	4.7	11.0 × 21.0 × 31.5	B32524R0475+***	–	1400	1280
		6.8	11.0 × 21.0 × 31.5	B32524Q0685+***	–	1400	1280
		10	11.0 × 21.0 × 31.5	B32524R0106+***	–	1400	1280
		15	11.0 × 21.0 × 31.5	B32524R0156+***	–	1400	1280
		22	11.0 × 21.0 × 31.5	B32524R0226+***	–	1400	1280
		33	12.5 × 21.5 × 31.5	B32524R0336+***	–	1200	1120
		47	18.0 × 27.5 × 31.5	B32524R0476+***	–	–	800
		68	18.0 × 27.5 × 31.5	B32524R0686+***	–	–	800
		100	22.0 × 36.5 × 31.5	B32524R0107+***	–	–	640
100	63	4.7	11.0 × 21.0 × 31.5	B32524Q1475+***	–	1400	1280
		6.8	11.0 × 21.0 × 31.5	B32524Q1685+***	–	1400	1280
		10	11.0 × 21.0 × 31.5	B32524Q1106+***	–	1400	1280
		15	11.0 × 21.0 × 31.5	B32524Q1156+***	–	1400	1280
		22	14.0 × 24.5 × 31.5	B32524Q1226+***	–	1000	1040
		33	18.0 × 27.5 × 31.5	B32524Q1336+***	–	–	800
		47	21.0 × 31.0 × 31.5	B32524Q1476+***	–	–	720
		68	22.0 × 36.5 × 31.5	B32524Q1686+***	–	–	640
250	160	1.5	11.0 × 21.0 × 31.5	B32524Q3155+***	–	1400	1280
		2.2	11.0 × 21.0 × 31.5	B32524Q3225+***	–	1400	1280
		3.3	11.0 × 21.0 × 31.5	B32524Q3335+***	–	1400	1280
		4.7	11.0 × 21.0 × 31.5	B32524Q3475+***	–	1400	1280
		6.8	11.0 × 21.0 × 31.5	B32524R3685+***	–	1400	1280
		10	12.5 × 21.5 × 31.5	B32524R3106+***	–	1200	1120
		15	15.0 × 24.5 × 31.5	B32524R3156+***	–	–	960
		22	19.0 × 30.0 × 31.5	B32524R3226+***	–	–	720
		33	22.0 × 36.5 × 31.5	B32524R3336+***	–	–	640

MOQ = Minimum Order Quantity, consisting of 4 packing units.
Further E series and intermediate capacitance values on request.

Composition of ordering code

+ = Capacitance tolerance code:
M = ±20%
K = ±10%
J = ±5%

*** = Packaging code:
289 = Ammo pack
189 = Reel
000 = Untaped (lead length 6 −1 mm)



Ordering codes and packing units (lead spacing 27.5 mm)

V_R V DC	V_{RMS} f ≤60 Hz V AC	C_R µF	Max. dimensions w × h × l mm	Ordering code (composition see below)	Ammo pack pcs./MOQ	Reel pcs./MOQ	Untaped pcs./MOQ
400	200	0.68	11.0 × 19.0 × 31.5	B32524Q6684+***	–	1400	1280
		1.0	11.0 × 19.0 × 31.5	B32524Q6105+***	–	1400	1280
		1.5	11.0 × 19.0 × 31.5	B32524Q6155+***	–	1400	1280
		2.2	11.0 × 21.0 × 31.5	B32524R6225+***	–	1400	1280
		3.3	14.0 × 24.5 × 31.5	B32524R6335+***	–	1000	1040
		4.7	14.0 × 24.5 × 31.5	B32524R6475+***	–	1000	1040
		6.8	18.0 × 27.5 × 31.5	B32524R6685+***	–	–	800
		10	22.0 × 36.5 × 31.5	B32524R6106+***	–	–	640
630	220	0.33	11.0 × 21.0 × 31.5	B32524Q8334+***	–	1400	1280
		0.47	11.0 × 21.0 × 31.5	B32524Q8474+***	–	1400	1280
		0.68	11.0 × 21.0 × 31.5	B32524Q8684+***	–	1400	1280
		1.0	14.0 × 24.5 × 31.5	B32524Q8105+***	–	1000	1040
		1.5	18.0 × 27.5 × 31.5	B32524Q8155+***	–	–	800
		2.2	21.0 × 31.0 × 31.5	B32524Q8225+***	–	–	720

MOQ = Minimum Order Quantity, consisting of 4 packing units.
Further E series and intermediate capacitance values on request.

Composition of ordering code

+ = Capacitance tolerance code:
- M = ±20%
- K = ±10%
- J = ±5%

*** = Packaging code:
- 289 = Ammo pack
- 189 = Reel
- 000 = Untaped (lead length 6 −1 mm)

Ordering codes and packing units (lead spacing 37.5 mm)

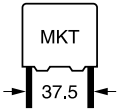
V_R V DC	V_{RMS} f ≤60 Hz V AC	C_R µF	Max. dimensions w × h × l mm	Ordering code (composition see below)	Ammo pack pcs./MOQ	Reel pcs./MOQ	Untaped pcs./MOQ
63	40	22	12.0 × 22.0 × 41.5	B32526R0226+***	–	–	1620
		33	12.0 × 22.0 × 41.5	B32526R0336+***	–	–	1620
		47	12.0 × 22.0 × 41.5	B32526R0476+***	–	–	1620
		56	24.0 × 15.0 × 41.5	B32526T0566+***	–	–	1040
		68	16.0 × 28.5 × 41.5	B32526R0686+***	–	–	800
		82	24.0 × 19.0 × 41.5	B32526T0826+***	–	–	780
		100	18.0 × 32.5 × 41.5	B32526R0107+***	–	–	720
		150	20.0 × 39.5 × 41.5	B32526R0157+***	–	–	640
		220	28.0 × 42.5 × 41.5	B32526R0227A***	–	–	440
100	63	15	12.0 × 22.0 × 41.5	B32526R1156+***	–	–	1620
		22	12.0 × 22.0 × 41.5	B32526R1226+***	–	–	1620
		33	14.0 × 25.0 × 41.5	B32526R1336+***	–	–	1380
		33	24.0 × 15.0 × 41.5	B32526T1336+***	–	–	1040
		47	16.0 × 28.5 × 41.5	B32526R1476+***	–	–	800
		47	24.0 × 19.0 × 41.5	B32526T1476+***	–	–	780
		68	18.0 × 32.5 × 41.5	B32526R1686+***	–	–	720
		100	20.0 × 39.5 × 41.5	B32526R1107+***	–	–	640
		150	28.0 × 42.5 × 41.5	B32526R1157+***	–	–	440
250	160	4.7	12.0 × 22.0 × 41.5	B32526R3475+***	–	–	1620
		6.8	12.0 × 22.0 × 41.5	B32526R3685+***	–	–	1620
		10	12.0 × 22.0 × 41.5	B32526R3106+***	–	–	1620
		15	14.0 × 25.0 × 41.5	B32526R3156+***	–	–	1380
		15	24.0 × 15.0 × 41.5	B32526T3156+***	–	–	1040
		22	16.0 × 28.5 × 41.5	B32526R3226+***	–	–	800
		22	24.0 × 19.0 × 41.5	B32526T3226+***	–	–	780
		33	20.0 × 39.5 × 41.5	B32526R3336+***	–	–	640
		47	20.0 × 39.5 × 41.5	B32526R3476+***	–	–	640
		68	28.0 × 42.5 × 41.5	B32526R3686+***	–	–	440

MOQ = Minimum Order Quantity, consisting of 4 packing units.
Further E series and intermediate capacitance values on request.

Composition of ordering code

+ = Capacitance tolerance code:
M = ±20%
K = ±10%
J = ±5%
A = −15 ... +5% (220 µF type only)

*** = Packaging code:
000 = Untaped (lead length 6 −1 mm)



Ordering codes and packing units (lead spacing 37.5 mm)

V_R V DC	V_{RMS} f ≤60 Hz V AC	C_R µF	Max. dimensions w × h × l mm	Ordering code (composition see below)	Ammo pack pcs./MOQ	Reel pcs./MOQ	Untaped pcs./MOQ
400	200	3.3	12.0 × 22.0 × 41.5	B32526R6335+***	–	–	1620
		4.7	12.0 × 22.0 × 41.5	B32526R6475+***	–	–	1620
		5.6	24.0 × 15.0 × 41.5	B32526T6565+***	–	–	1040
		6.8	14.0 × 25.0 × 41.5	B32526R6685+***	–	–	1380
		8.2	24.0 × 19.0 × 41.5	B32526T6825+***	–	–	780
		10	18.0 × 32.5 × 41.5	B32526R6106+***	–	–	720
		15	20.0 × 39.5 × 41.5	B32526R6156+***	–	–	640
		22	28.0 × 42.5 × 41.5	B32526R6226+***	–	–	440

MOQ = Minimum Order Quantity, consisting of 4 packing units.
Further E series and intermediate capacitance values on request.

Composition of ordering code

+ = Capacitance tolerance code:
- M = ±20%
- K = ±10%
- J = ±5%
- A = −15 ... +5% (220 µF type only)

*** = Packaging code:
- 000 = Untaped (lead length 6 −1 mm)

Technical data

Operating temperature range	Max. operating temperature $T_{op,max}$	+125 °C		
	Upper category temperature T_{max}	+125 °C		
	Lower category temperature T_{min}	−55 °C		
	Rated temperature T_R	+85 °C		
Dissipation factor tan δ (in 10^{-3})	at	$C_R \leq 0.1$ µF	0.1 µF < $C_R \leq 1$ µF	$C_R > 1$ µF
at 20 °C	1 kHz	8	8	10
(upper limit values)	10 kHz	15	15	–
	100 kHz	30	–	–
Insulation resistance R_{ins}	V_R	$C_R \leq 0.33$ µF	$C_R > 0.33$ µF	
or time constant $\tau = C_R \cdot R_{ins}$	≤ 100 V DC	3750 MΩ	1250 s	
at 20 °C, rel. humidity ≤ 65%	≥ 250 V DC	7500 MΩ	2500 s	
(minimum as-delivered values)				
DC test voltage	1.4 · V_R, 2 s			
Category voltage V_C	T_A (°C)	DC voltage derating	AC voltage derating	
(continuous operation with V_{DC}	$T_A \leq 85$	$V_C = V_R$	$V_{C,RMS} = V_{RMS}$	
or V_{AC} at f ≤ 60 Hz)	$85<T_A\leq125$	$V_C = V_R \cdot (165-T_A)/80$	$V_{C,RMS}=V_{RMS} \cdot (165-T_A)/80$	
Operating voltage V_{op} for	T_A (°C)	DC voltage (max. hours)	AC voltage (max. hours)	
short operating periods	$T_A \leq 100$	$V_{op} = 1.25 \cdot V_C$ (2000 h)	$V_{op} = 1.0 \cdot V_{C,RMS}$ (2000 h)	
(V_{DC} or V_{AC} at f ≤ 60 Hz)	$100<T_A\leq125$	$V_{op} = 1.25 \cdot V_C$ (1000 h)	$V_{op} = 1.0 \cdot V_{C,RMS}$ (1000 h)	
Damp heat test	56 days/40 °C/93% relative humidity			
Limit values after damp	Capacitance change |ΔC/C|	≤ 5%		
heat test	Dissipation factor change Δ tan δ	≤ 5 · 10^{-3} (at 1 kHz)		
	Insulation resistance R_{ins}	≥ 50% of minimum		
	or time constant $\tau = C_R \cdot R_{ins}$	as-delivered values		
Reliability:				
Failure rate λ	1 fit (≤ 1 · 10^{-9}/h) at 0.5 · V_R, 40 °C			
Service life t_{SL}	200 000 h at 1.0 · V_R, 85 °C			
	For conversion to other operating conditions and temperatures, refer to chapter "Quality, 2 Reliability".			
Failure criteria:				
Total failure	Short circuit or open circuit			
Failure due to variation	Capacitance change |ΔC/C|	> 10%		
of parameters	Dissipation factor tan δ	> 2 · upper limit value		
	Insulation resistance R_{ins}	< 150 MΩ ($C_R \leq 0.33$ µF)		
	or time constant $\tau = C_R \cdot R_{ins}$	< 50 s ($C_R > 0.33$ µF)		

Pulse handling capability

"dV/dt" represents the maximum permissible voltage change per unit of time for non-sinusoidal voltages, expressed in V/µs.

"k_0" represents the maximum permissible pulse characteristic of the waveform applied to the capacitor, expressed in V^2/µs.

Note:
The values of dV/dt and k_0 provided below must not be exceeded in order to avoid damaging the capacitor.

dV/dt values

Lead spacing		5 mm	7.5 mm	10 mm		15 mm		22.5 mm	27.5 mm	37.5 mm
Technology		S	S	S	W	S	W	W	W	W
V_R V DC	V_{RMS} V AC	dV/dt in V/µs								
63	40	250	120	50	–	30	–	3	1	0.8
100	63	300	150	75	–	50	5	4	3	1
250	160	400	200	150	–	100	10	8	5	4
400	200	600	275	175	–	125	–	10	8.5	6
450	200	–	–	–	–	–	20	–	–	–
630	400	800	–	320	–	150	–	15	12	–

S = Stacked, W = Wound

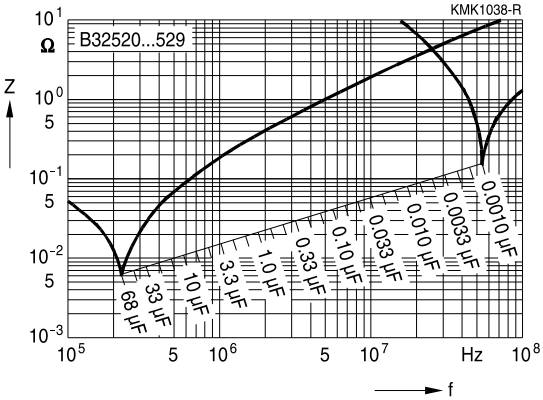
k_0 values

Lead spacing		5 mm	7.5 mm	10 mm		15 mm		22.5 mm	27.5 mm	37.5 mm
Technology		S	S	S	W	S	W	W	W	W
V_R V DC	V_{RMS} V AC	k_0 in V^2/µs								
63	40	30000	15000	6300	–	3800	–	375	130	100
100	63	60000	30000	15000	–	10000	850	800	600	200
250	160	200000	100000	75000	–	50000	5000	4000	2500	2000
400	200	500000	220000	140000	–	100000	–	10000	8500	6000
450	200	–	–	–	–	–	15000	–	–	–
630	400	1000000	–	400000	–	190000	–	18000	15000	–

S = Stacked, W = Wound

Impedance Z versus frequency f

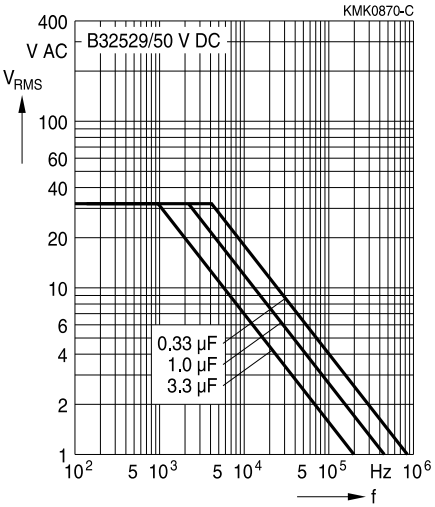
(typical values)



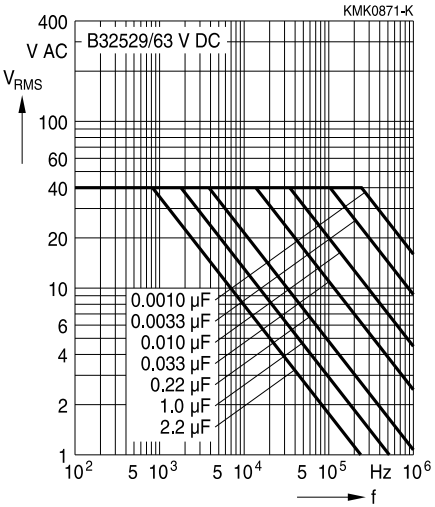
Permissible AC voltage V_{RMS} versus frequency f (for sinusoidal waveforms, $T_A \leq 55$ °C)
For T_A >55 °C, please refer to "General technical information", section 3.2.3.

Lead spacing 5 mm

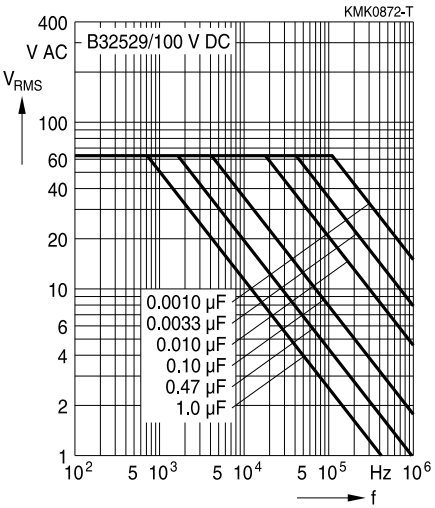
50 V DC/32 V AC



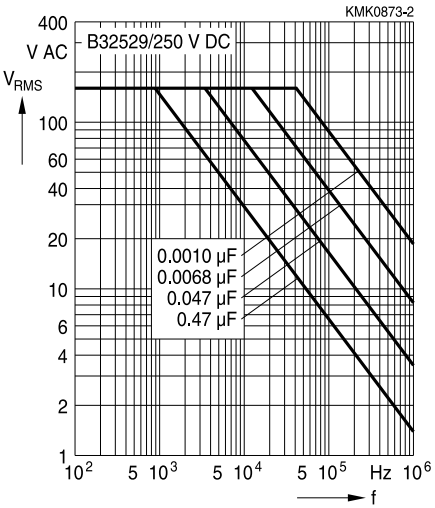
63 V DC/40 V AC



100 V DC/63 V AC



250 V DC/160 V AC

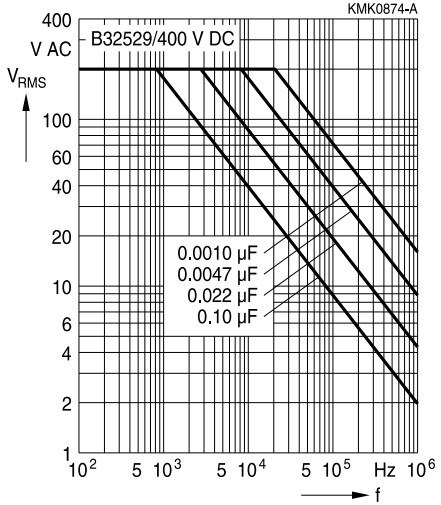


Permissible AC voltage V_{RMS} versus frequency f (for sinusoidal waveforms, $T_A \leq 55$ °C)

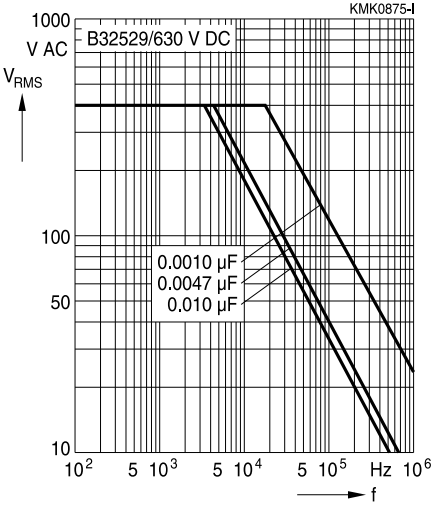
For T_A >55 °C, please refer to "General technical information", section 3.2.3.

Lead spacing 5 mm

400 V DC/200 V AC



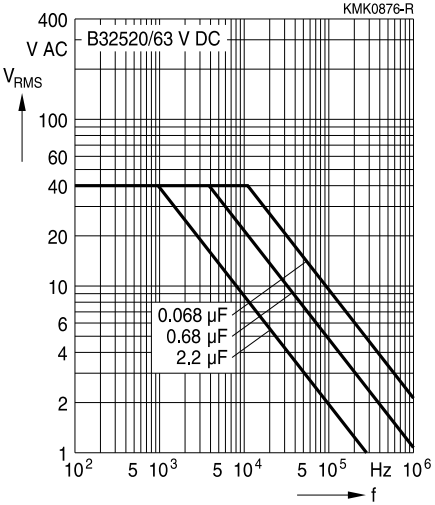
630 V DC/400 V AC



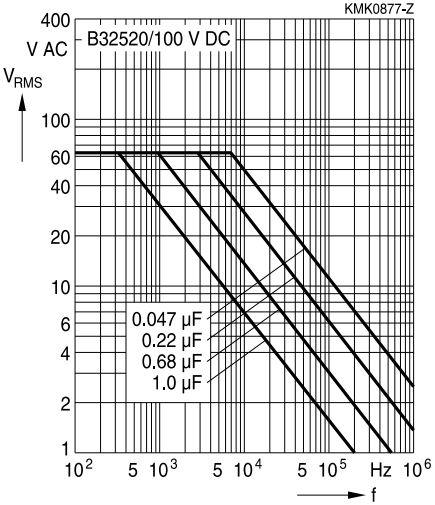
Permissible AC voltage V_{RMS} versus frequency f (for sinusoidal waveforms, $T_A \leq 55$ °C)
For T_A >55 °C, please refer to "General technical information", section 3.2.3.

Lead spacing 7.5 mm

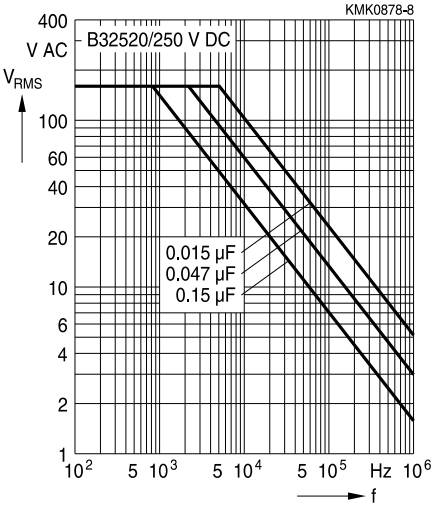
63 V DC/40 V AC



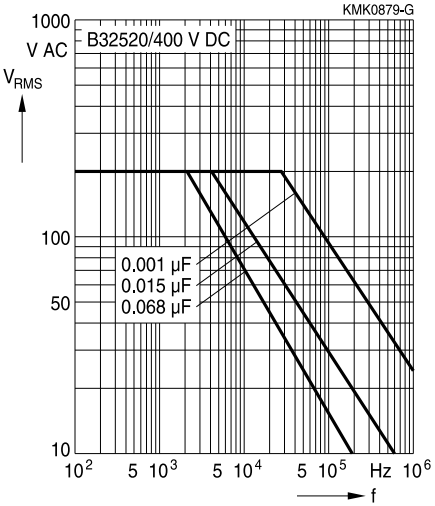
100 V DC/63 V AC



250 V DC/160 V AC



400 V DC/200 V AC

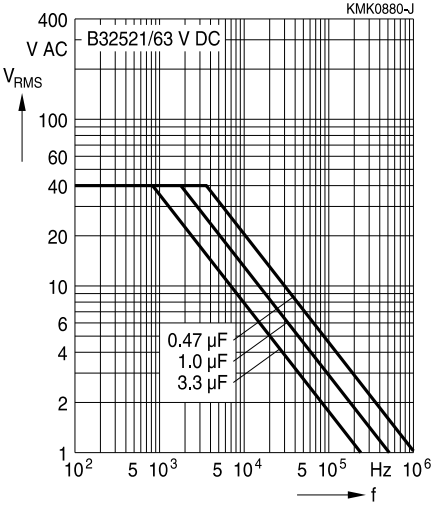


Permissible AC voltage V_{RMS} versus frequency f (for sinusoidal waveforms, $T_A \leq 55$ °C)

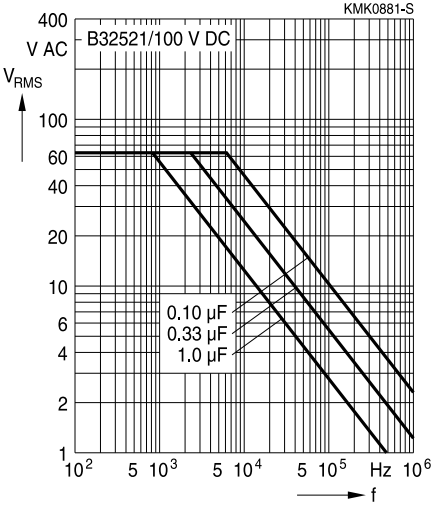
For T_A >55 °C, please refer to "General technical information", section 3.2.3.

Lead spacing 10 mm

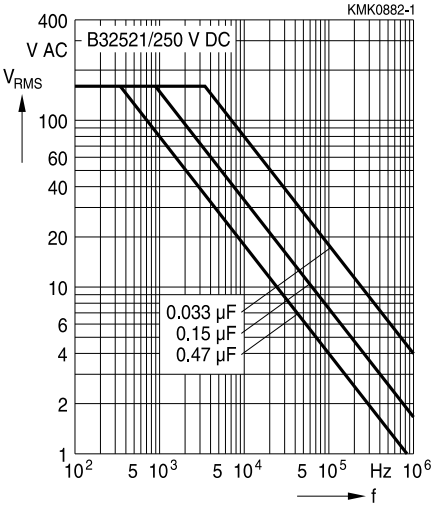
63 V DC/40 V AC



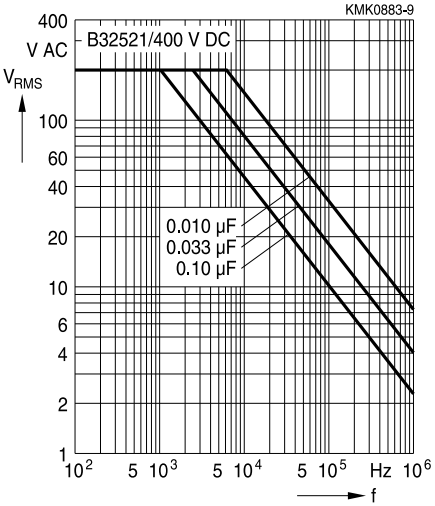
100 V DC/63 V AC



250 V DC/160 V AC



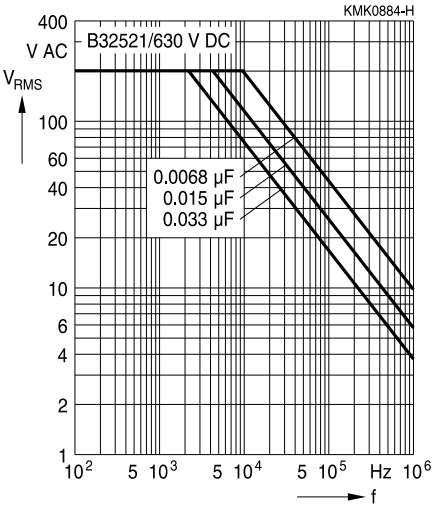
400 V DC/200 V AC



Permissible AC voltage V_{RMS} versus frequency f (for sinusoidal waveforms, $T_A \leq 55$ °C)
For T_A >55 °C, please refer to "General technical information", section 3.2.3.

Lead spacing 10 mm

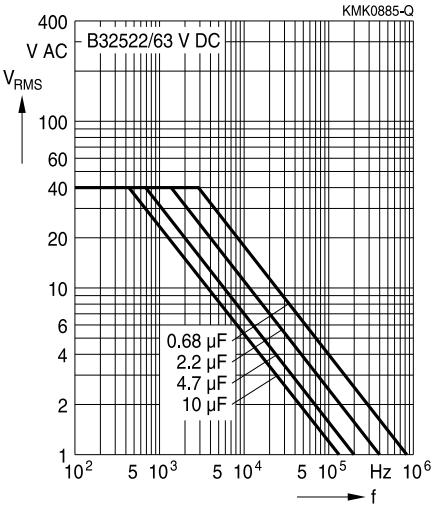
630 V DC/200 V AC



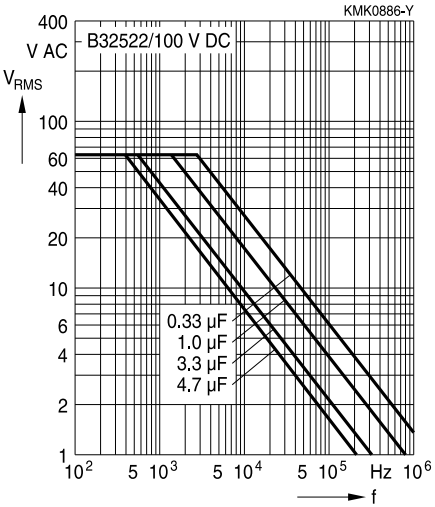
Permissible AC voltage V_{RMS} versus frequency f (for sinusoidal waveforms, $T_A \leq 55$ °C)
For T_A >55 °C, please refer to "General technical information", section 3.2.3.

Lead spacing 15 mm

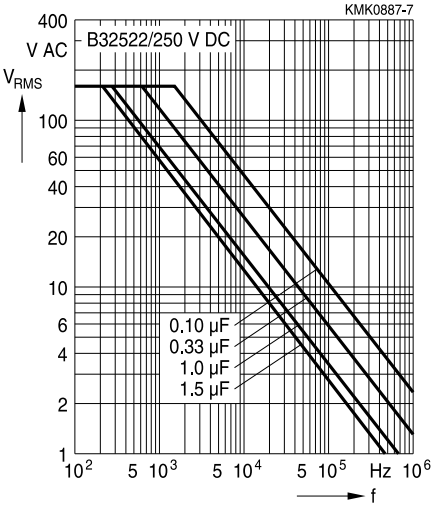
63 V DC/40 V AC



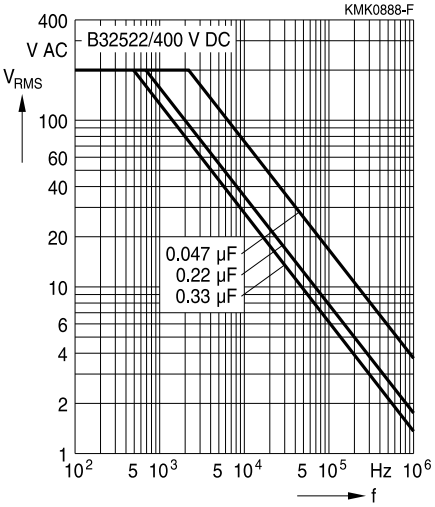
100 V DC/63 V AC



250 V DC/160 V AC



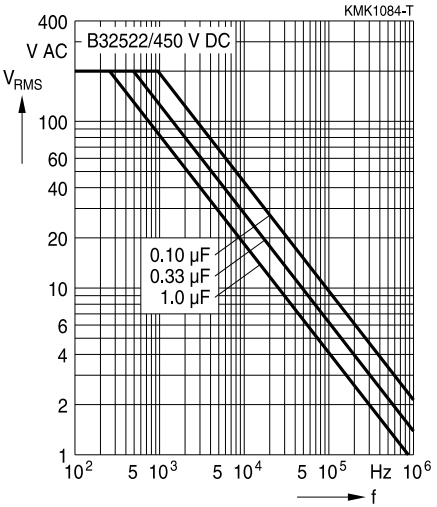
400 V DC/200 V AC



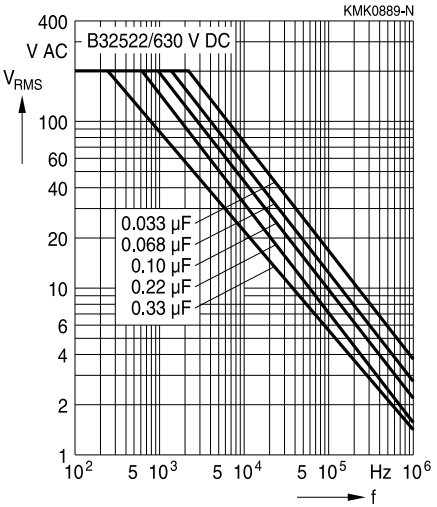
Permissible AC voltage V_{RMS} versus frequency f (for sinusoidal waveforms, $T_A \leq 55$ °C)
For T_A >55 °C, please refer to "General technical information", section 3.2.3.

Lead spacing 15 mm

450 V DC/200 V AC



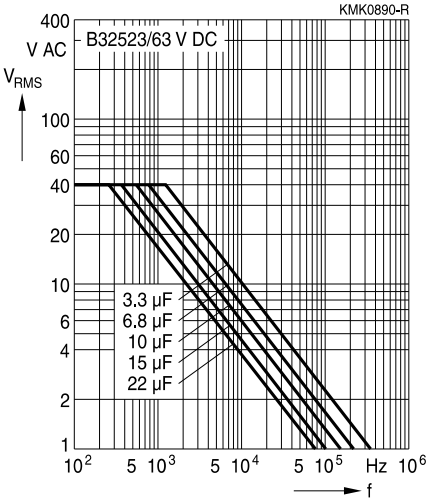
630 V DC/200 V AC



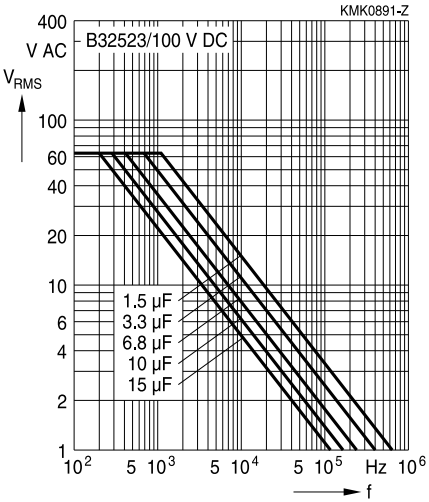
Permissible AC voltage V_{RMS} versus frequency f (for sinusoidal waveforms, $T_A \leq 55$ °C)
For T_A >55 °C, please refer to "General technical information", section 3.2.3.

Lead spacing 22.5 mm

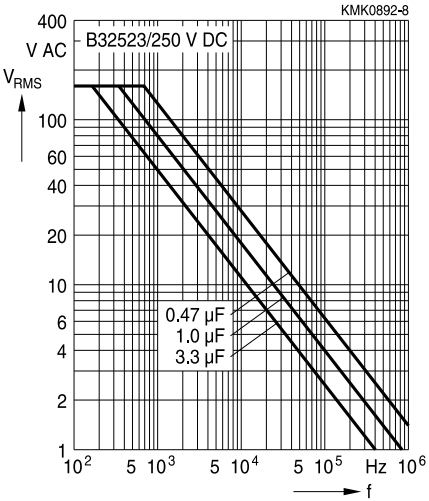
63 V DC/40 V AC



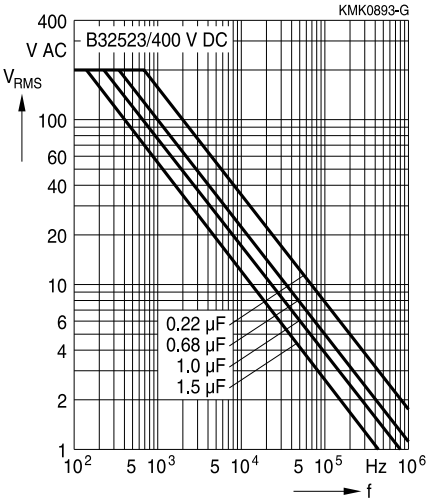
100 V DC/63 V AC

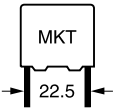


250 V DC/160 V AC



400 V DC/200 V AC



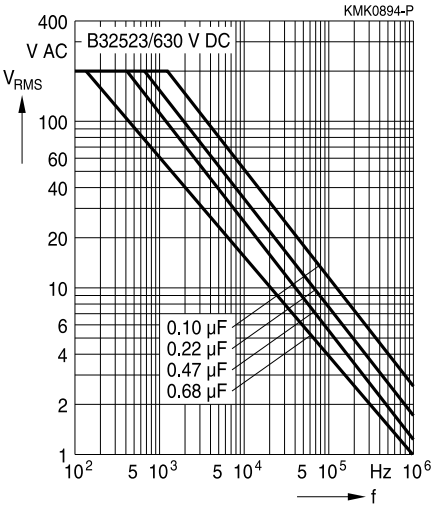


Permissible AC voltage V_{RMS} versus frequency f (for sinusoidal waveforms, T_A ≤55 °C)

For T_A >55 °C, please refer to "General technical information", section 3.2.3.

Lead spacing 22.5 mm

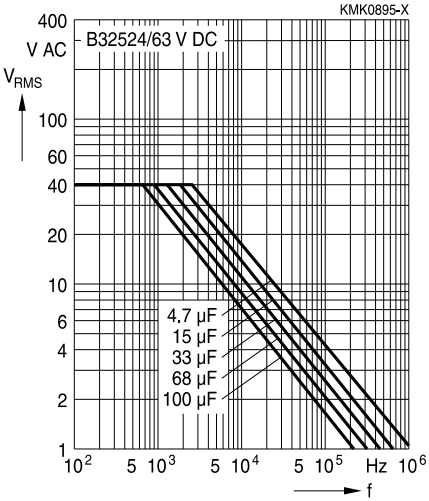
630 V DC/200 V AC



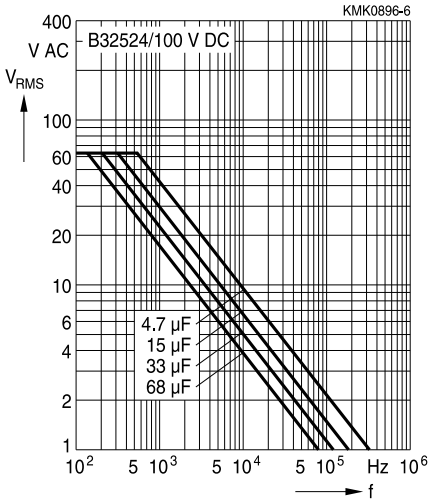
Permissible AC voltage V_{RMS} versus frequency f (for sinusoidal waveforms, $T_A \leq 55$ °C)
For T_A >55 °C, please refer to "General technical information", section 3.2.3.

Lead spacing 27.5 mm

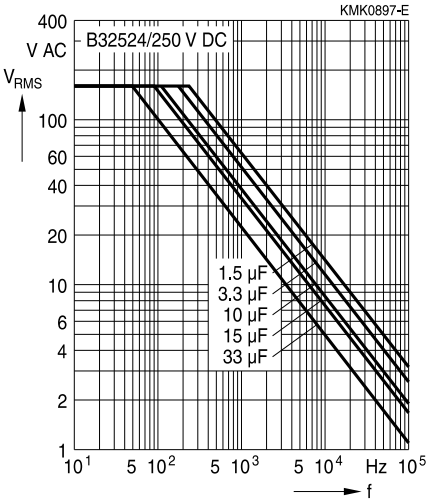
63 V DC/40 V AC



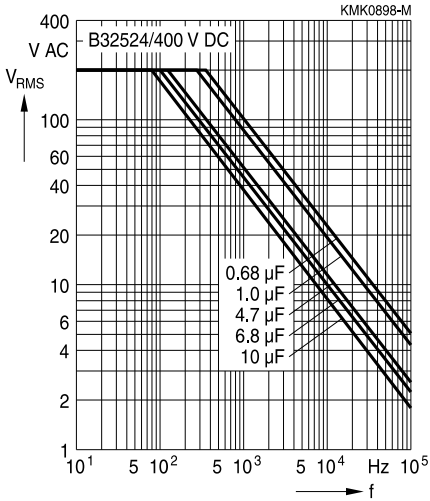
100 V DC/63 V AC

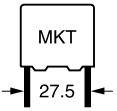


250 V DC/160 V AC



400 V DC/200 V AC

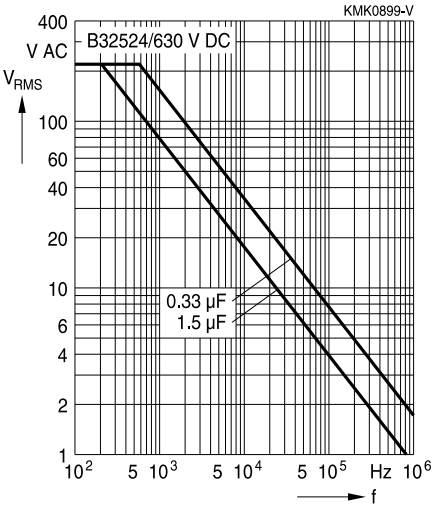




Permissible AC voltage V_{RMS} versus frequency f (for sinusoidal waveforms, T_A ≤55 °C)
For T_A >55 °C, please refer to "General technical information", section 3.2.3.

Lead spacing 27.5 mm

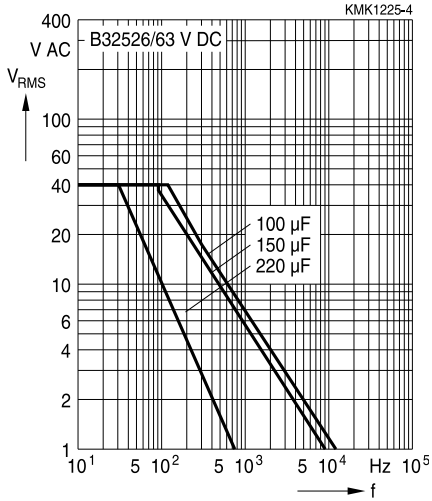
630 V DC/220 V AC



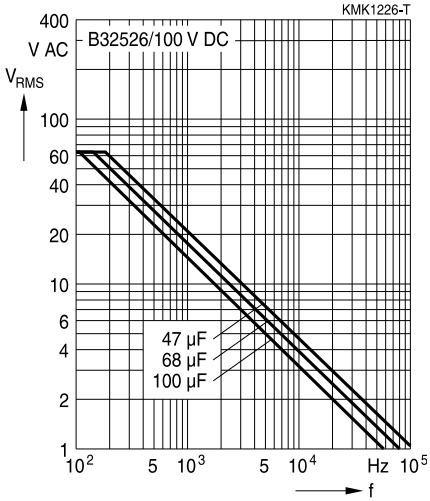
Permissible AC voltage V_{RMS} versus frequency f (for sinusoidal waveforms, $T_A \leq 55$ °C)
For T_A >55 °C, please refer to "General technical information", section 3.2.3.

Lead spacing 37.5 mm

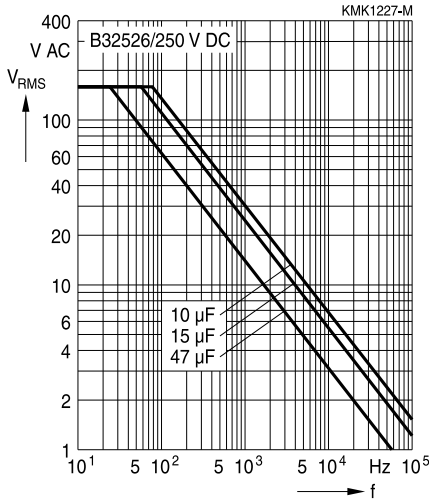
63 V DC/40 V AC



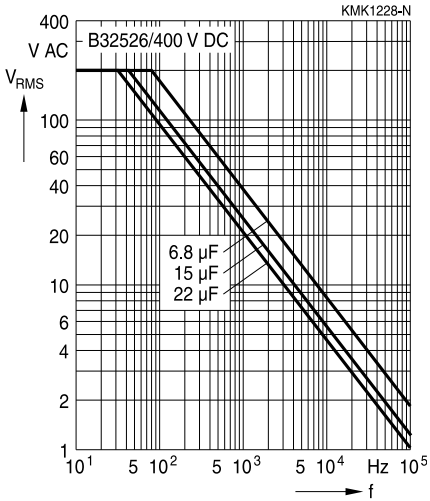
100 V DC/63 V AC



250 V DC/160 V AC



400 V DC/200 V AC



Mounting guidelines

1 Soldering

1.1 Solderability of leads

The solderability of terminal leads is tested to IEC 60068-2-20, test Ta, method 1.

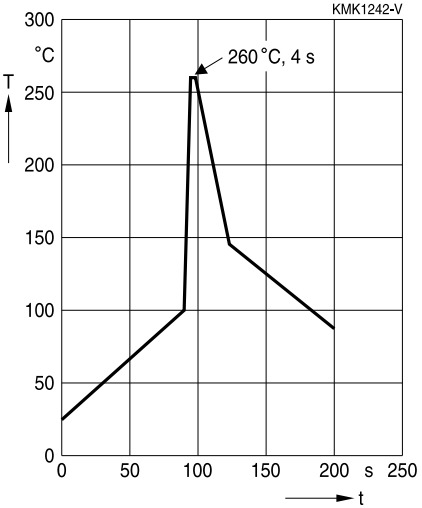
Before a solderability test is carried out, terminals are subjected to accelerated ageing (to IEC 60068-2-2, test Ba: 4 h exposure to dry heat at 155 °C). Since the ageing temperature is far higher than the upper category temperature of the capacitors, the terminal wires should be cut off from the capacitor before the ageing procedure to prevent the solderability being impaired by the products of any capacitor decomposition that might occur.

Solder bath temperature	235 ±5 °C
Soldering time	2.0 ±0.5 s
Immersion depth	2.0 +0/−0.5 mm from capacitor body or seating plane
Evaluation criteria: Visual inspection	 Wetting of wire surface by new solder ≥90%, free-flowing solder

1.2 Resistance to soldering heat

Resistance to soldering heat is tested to IEC 60068-2-20, test Tb, method 1A.
Conditions:

Series		Solder bath temperature	Soldering time
MKT	boxed (except 2.5 × 6.5 × 7.2 mm) coated uncoated (lead spacing > 10 mm)	260 ±5 °C	10 ±1 s
MFP MKP	 (lead spacing > 7.5 mm)		
MKT	boxed (case 2.5 × 6.5 × 7.2 mm)		5 ±1 s
MKP MKT	(lead spacing ≤ 7.5 mm) uncoated (lead spacing ≤ 10 mm) insulated (B32559)		< 4 s recommended soldering profile for MKT uncoated (lead spacing ≤ 10 mm) and insulated (B32559)



Immersion depth	2.0 +0/−0.5 mm from capacitor body or seating plane
Shield	Heat-absorbing board, (1.5 ±0.5) mm thick, between capacitor body and liquid solder
Evaluation criteria:	
Visual inspection	No visible damage
$\Delta C/C_0$	2% for MKT/MKP/MFP 5% for EMI suppression capacitors
tan δ	As specified in sectional specification

1.3 General notes on soldering

Permissible heat exposure loads on film capacitors are primarily characterized by the upper category temperature T_{max}. Long exposure to temperatures above this type-related temperature limit can lead to changes in the plastic dielectric and thus change irreversibly a capacitor's electrical characteristics. For short exposures (as in practical soldering processes) the heat load (and thus the possible effects on a capacitor) will also depend on other factors like:

- Pre-heating temperature and time
- Forced cooling immediately after soldering
- Terminal characteristics:
  diameter, length, thermal resistance, special configurations (e.g. crimping)
- Height of capacitor above solder bath
- Shadowing by neighboring components
- Additional heating due to heat dissipation by neighboring components
- Use of solder-resist coatings

The overheating associated with some of these factors can usually be reduced by suitable countermeasures. For example, if a pre-heating step cannot be avoided, an additional or reinforced cooling process may possibly have to be included.

EPCOS recommends the following conditions:

- Pre-heating with a maximum temperature of 110 °C
- Temperature inside the capacitor should not exceed the following limits:
  - MKP/MFP 110 °C
  - MKT 160 °C
- When SMD components are used together with leaded ones, the leaded film capacitors should not pass into the SMD adhesive curing oven. The leaded components should be assembled after the SMD curing step.
- Leaded film capacitors are not suitable for reflow soldering.

Uncoated capacitors

For uncoated MKT capacitors with lead spacings ≤10 mm (B32560/B32561) the following measures are recommended:

- pre-heating to not more than 110 °C in the preheater phase
- rapid cooling after soldering

Cautions and warnings

- Do not exceed the upper category temperature (UCT).
- Do not apply any mechanical stress to the capacitor terminals.
- Avoid any compressive, tensile or flexural stress.
- Do not move the capacitor after it has been soldered to the PC board.
- Do not pick up the PC board by the soldered capacitor.
- Do not place the capacitor on a PC board whose PTH hole spacing differs from the specified lead spacing.
- Do not exceed the specified time or temperature limits during soldering.
- Avoid external energy inputs, such as fire or electricity.
- Avoid overload of the capacitors.

The table below summarizes the safety instructions that must always be observed. A detailed description can be found in the relevant sections of the chapters "General technical information" and "Mounting guidelines".

Topic	Safety information	Reference chapter "General technical information"
Storage conditions	Make sure that capacitors are stored within the specified range of time, temperature and humidity conditions.	4.5 "Storage conditions"
Flammability	Avoid external energy, such as fire or electricity (passive flammability), avoid overload of the capacitors (active flammability) and consider the flammability of materials.	5.3 "Flammability"
Resistance to vibration	Do not exceed the tested ability to withstand vibration. The capacitors are tested to IEC 60068-2-6. EPCOS offers film capacitors specially designed for operation under more severe vibration regimes such as those found in automotive applications. Consult our catalog "Film Capacitors for Automotive Electronics".	5.2 "Resistance to vibration"

Topic	Safety information	Reference chapter "Mounting guidelines"
Soldering	Do not exceed the specified time or temperature limits during soldering.	1 "Soldering"
Cleaning	Use only suitable solvents for cleaning capacitors.	2 "Cleaning"
Embedding of capacitors in finished assemblies	When embedding finished circuit assemblies in plastic resins, chemical and thermal influences must be taken into account. Caution: Consult us first, if you also wish to embed other uncoated component types!	3 "Embedding of capacitors in finished assemblies"

Symbols and terms

Symbol	English	German
α	Heat transfer coefficient	Wärmeübergangszahl
α_C	Temperature coefficient of capacitance	Temperaturkoeffizient der Kapazität
A	Capacitor surface area	Kondensatoroberfläche
β_C	Humidity coefficient of capacitance	Feuchtekoeffizient der Kapazität
C	Capacitance	Kapazität
C_R	Rated capacitance	Nennkapazität
ΔC	Absolute capacitance change	Absolute Kapazitätsänderung
$\Delta C/C$	Relative capacitance change (relative deviation of actual value)	Relative Kapazitätsänderung (relative Abweichung vom Ist-Wert)
$\Delta C/C_R$	Capacitance tolerance (relative deviation from rated capacitance)	Kapazitätstoleranz (relative Abweichung vom Nennwert)
dt	Time differential	Differentielle Zeit
Δt	Time interval	Zeitintervall
ΔT	Absolute temperature change (self-heating)	Absolute Temperaturänderung (Selbsterwärmung)
$\Delta \tan \delta$	Absolute change of dissipation factor	Absolute Änderung des Verlustfaktors
ΔV	Absolute voltage change	Absolute Spannungsänderung
dV/dt	Time differential of voltage function (rate of voltage rise)	Differentielle Spannungsänderung (Spannungsflankensteilheit)
$\Delta V/\Delta t$	Voltage change per time interval	Spannungsänderung pro Zeitintervall
E	Activation energy for diffusion	Aktivierungsenergie zur Diffusion
ESL	Self-inductance	Eigeninduktivität
ESR	Equivalent series resistance	Ersatz-Serienwiderstand
f	Frequency	Frequenz
f_1	Frequency limit for reducing permissible AC voltage due to thermal limits	Grenzfrequenz für thermisch bedingte Reduzierung der zulässigen Wechselspannung
f_2	Frequency limit for reducing permissible AC voltage due to current limit	Grenzfrequenz für strombedingte Reduzierung der zulässigen Wechselspannung
f_r	Resonant frequency	Resonanzfrequenz
F_D	Thermal acceleration factor for diffusion	Therm. Beschleunigungsfaktor zur Diffusion
F_T	Derating factor	Deratingfaktor
i	Current (peak)	Stromspitze
I_C	Category current (max. continuous current)	Kategoriestrom (max. Dauerstrom)

Symbol	English	German
I_{RMS}	(Sinusoidal) alternating current, root-mean-square value	(Sinusförmiger) Wechselstrom
i_z	Capacitance drift	Inkonstanz der Kapazität
k_0	Pulse characteristic	Impulskennwert
L_S	Series inductance	Serieninduktivität
λ	Failure rate	Ausfallrate
λ_0	Constant failure rate during useful service life	Konstante Ausfallrate in der Nutzungsphase
λ_{test}	Failure rate, determined by tests	Experimentell ermittelte Ausfallrate
P_{diss}	Dissipated power	Abgegebene Verlustleistung
P_{gen}	Generated power	Erzeugte Verlustleistung
Q	Heat energy	Wärmeenergie
ρ	Density of water vapor in air	Dichte von Wasserdampf in Luft
R	Universal molar constant for gases	Allg. Molarkonstante für Gas
R	Ohmic resistance of discharge circuit	Ohmscher Widerstand des Entladekreises
R_i	Internal resistance	Innenwiderstand
R_{ins}	Insulation resistance	Isolationswiderstand
R_P	Parallel resistance	Parallelwiderstand
R_S	Series resistance	Serienwiderstand
S	severity (humidity test)	Schärfegrad (Feuchtetest)
t	Time	Zeit
T	Temperature	Temperatur
τ	Time constant	Zeitkonstante
$\tan \delta$	Dissipation factor	Verlustfaktor
$\tan \delta_D$	Dielectric component of dissipation factor	Dielektrischer Anteil des Verlustfaktors
$\tan \delta_P$	Parallel component of dissipation factor	Parallelanteil des Verlfustfaktors
$\tan \delta_S$	Series component of dissipation factor	Serienanteil des Verlustfaktors
T_A	Ambient temperature	Umgebungstemperatur
T_{max}	Upper category temperature	Obere Kategorietemperatur
T_{min}	Lower category temperature	Untere Kategorietemperatur
t_{OL}	Operating life at operating temperature and voltage	Betriebszeit bei Betriebstemperatur und -spannung
T_{op}	Operating temperature	Beriebstemperatur
T_R	Rated temperature	Nenntemperatur
T_{ref}	Reference temperature	Referenztemperatur
t_{SL}	Reference service life	Referenz-Lebensdauer
V_{AC}	AC voltage	Wechselspannung

Symbol	English	German
V_C	Category voltage	Kategoriespannung
$V_{C,RMS}$	Category AC voltage	(Sinusförmige) Kategorie-Wechselspannung
V_{CD}	Corona-discharge onset voltage	Teilentlade-Einsatzspannung
V_{ch}	Charging voltage	Ladespannung
V_{DC}	DC voltage	Gleichspannung
V_{FB}	Fly-back capacitor voltage	Spannung (Flyback)
V_i	Input voltage	Eingangsspannung
V_o	Output voltage	Ausgangssspannung
V_{op}	Operating voltage	Betriebsspannung
V_p	Peak pulse voltage	Impuls-Spitzenspannung
V_{pp}	Peak-to-peak voltage Impedance	Spannungshub
V_R	Rated voltage	Nennspannung
$\hat{v}_R$	Amplitude of rated AC voltage	Amplitude der Nenn-Wechselspannung
V_{RMS}	(Sinusoidal) alternating voltage, root-mean-square value	(Sinusförmige) Wechselspannung
V_{SC}	S-correction voltage	Spannung bei Anwendung "S-correction"
V_{sn}	Snubber capacitor voltage	Spannung bei Anwendung "Beschaltung"
Z	Impedance	Scheinwiderstand
$\boxed{e}$	Lead spacing	Rastermaß

Important notes

The following applies to all products named in this publication:

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