



# Film Capacitors

## Metallized Polyester Film Capacitors (MKT)

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

**Date:** June 2018

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**General purpose (stacked/wound)**
**Typical applications**

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

**Climatic**

- Max. operating temperature: 125 °C
- Climatic category (IEC 60068-1:2013): 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
- RoHS-compatible
- Halogen-free capacitors available on request
- AEC-Q200D compliant

**Terminals**

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

**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  $\geq 10$  mm

**Delivery mode**

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

**Dimensional drawing**


Dimensions in mm

Lead spacing $e \pm 0.4$	Lead diameter $d_1 \pm 0.05$	Type
5.0	0.5	B32529
7.5	0.5	B32520
10.0	0.6 <sup>1)</sup>	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



Overview of available types

Lead spacing	5.0 mm						7.5 mm				10.0 mm				
Type	B32529						B32520				B32521				
Page	6						9				10				
Technology	s	s	s	s	s	s	s	s	s	s	s	s	s	s	s
$V_R$ (V DC)	50	63	100	250	400	630	63	100	250	400	63	100	250	400	630
$V_{RMS}$ (V AC)	32	40	63	160	200	400	40	63	160	200	40	63	160	200	200
$C_R$ ( $\mu$ F)															
0.0010															
0.0015															
0.0022															
0.0033															
0.0047															
0.0068															
0.010															
0.015															
0.022															
0.033															
0.047															
0.056															
0.068															
0.082															
0.10															
0.12															
0.15															
0.18															
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



B32520 ... B32529

General purpose (stacked/wound)

### Overview of available types

Lead spacing	15.0 mm						22.5 mm					27.5 mm				
Type	B32522						B32523					B32524				
Page	12						14					15				
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
$C_R$ ( $\mu$ F)																
0.047																
0.068																
0.10																
0.15																
0.22																
0.33																
0.39																
0.47																
0.56																
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	17			
Technology	w	w	w	w
$V_R$ (V DC)	63	100	250	400
$V_{RMS}$ (V AC)	40	63	160	200
$C_R$ ( $\mu$ F)				
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


**B32529**
**General purpose (stacked)**
**Ordering codes and packing units (lead spacing 5 mm)**

$V_R$	$V_{RMS}$ $f \leq 60$ Hz	$C_R$	Max. dimensions $w \times h \times l$ mm	Ordering code (composition see below)	Ammo pack pcs./MOQ	Reel pcs./MOQ	Untaped pcs./MOQ
V DC	V AC	$\mu F$					
50	32	3.3	7.8 × 13.0 × 7.8	B32529D5335+***	4000	3200	4000
		4.7	7.8 × 13.0 × 7.8	B32529D5475M***	4000	3200	4000
63	40	0.0010	2.5 × 6.5 × 7.3	B32529C0102+***	12800	11200	8000
		0.0015	2.5 × 6.5 × 7.3	B32529C0152+***	12800	11200	8000
		0.0022	2.5 × 6.5 × 7.3	B32529C0222+***	12800	11200	8000
		0.0033	2.5 × 6.5 × 7.3	B32529C0332+***	12800	11200	8000
		0.0047	2.5 × 6.5 × 7.3	B32529C0472+***	12800	11200	8000
		0.0068	2.5 × 6.5 × 7.3	B32529C0682+***	12800	11200	8000
		0.010	2.5 × 6.5 × 7.3	B32529C0103+***	12800	11200	8000
		0.015	2.5 × 6.5 × 7.3	B32529C0153+***	12800	11200	8000
		0.022	2.5 × 6.5 × 7.3	B32529C0223+***	12800	11200	8000
		0.033	2.5 × 6.5 × 7.3	B32529C0333+***	12800	11200	8000
		0.047	2.5 × 6.5 × 7.3	B32529C0473+***	12800	11200	8000
		0.068	2.5 × 6.5 × 7.3	B32529C0683+***	12800	11200	8000
		0.10	2.5 × 6.5 × 7.3	B32529C0104+***	12800	11200	8000
		0.15	2.5 × 6.5 × 7.3	B32529C0154+***	12800	11200	8000
		0.22	2.5 × 6.5 × 7.3	B32529C0224+***	12800	11200	8000
		0.33	3.0 × 6.5 × 7.3	B32529C0334+***	10800	9600	8000
		0.47	3.5 × 8.0 × 7.3	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		
100	63	0.0010	2.5 × 6.5 × 7.3	B32529C1102+***	12800	11200	8000
		0.0015	2.5 × 6.5 × 7.3	B32529C1152+***	12800	11200	8000
		0.0022	2.5 × 6.5 × 7.3	B32529C1222+***	12800	11200	8000
		0.0033	2.5 × 6.5 × 7.3	B32529C1332+***	12800	11200	8000
		0.0047	2.5 × 6.5 × 7.3	B32529C1472+***	12800	11200	8000
		0.0068	2.5 × 6.5 × 7.3	B32529C1682+***	12800	11200	8000
		0.010	2.5 × 6.5 × 7.3	B32529C1103+***	12800	11200	8000
		0.015	2.5 × 6.5 × 7.3	B32529C1153+***	12800	11200	8000

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 (standard lead length 6 – 1 mm)


**Ordering codes and packing units (lead spacing 5 mm)**

$V_R$	$V_{RMS}$ $f \leq 60$ Hz	$C_R$	Max. dimensions $w \times h \times l$	Ordering code (composition see below)	Ammo pack pcs./MOQ	Reel pcs./MOQ	Untaped pcs./MOQ
V DC	V AC	$\mu F$	mm				
100	63	0.022	2.5 × 6.5 × 7.3	B32529C1223+***	12800	11200	8000
		0.033	2.5 × 6.5 × 7.3	B32529C1333+***	12800	11200	8000
		0.047	2.5 × 6.5 × 7.3	B32529C1473+***	12800	11200	8000
		0.068	2.5 × 6.5 × 7.3	B32529C1683+***	12800	11200	8000
		0.10	2.5 × 6.5 × 7.3	B32529C1104+***	12800	11200	8000
		0.15	3.0 × 6.5 × 7.3	B32529C1154+***	10800	9600	8000
		0.22	3.5 × 8.0 × 7.3	B32529C1224+***	9200	8000	8000
		0.33	3.5 × 8.0 × 7.3	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
250	160	0.0010	2.5 × 6.5 × 7.3	B32529C3102+***	12800	11200	8000
		0.0015	2.5 × 6.5 × 7.3	B32529C3152+***	12800	11200	8000
		0.0022	2.5 × 6.5 × 7.3	B32529C3222+***	12800	11200	8000
		0.0033	2.5 × 6.5 × 7.3	B32529C3332+***	12800	11200	8000
		0.0047	2.5 × 6.5 × 7.3	B32529C3472+***	12800	11200	8000
		0.0068	2.5 × 6.5 × 7.3	B32529C3682+***	12800	11200	8000
		0.010	2.5 × 6.5 × 7.3	B32529C3103+***	12800	11200	8000
		0.015	2.5 × 6.5 × 7.3	B32529C3153+***	12800	11200	8000
		0.022	2.5 × 6.5 × 7.3	B32529C3223+***	12800	11200	8000
		0.033	3.0 × 6.5 × 7.3	B32529C3333+***	10800	9600	8000
		0.047	3.5 × 8.0 × 7.3	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 (standard lead length 6 – 1 mm)


**B32529**
**General purpose (stacked)**
**Ordering codes and packing units (lead spacing 5 mm)**

$V_R$	$V_{RMS}$ $f \leq 60$ Hz	$C_R$	Max. dimensions $w \times h \times l$ mm	Ordering code (composition see below)	Ammo pack pcs./MOQ	Reel pcs./MOQ	Untaped pcs./MOQ
V DC	V AC	$\mu F$					
400	200	0.0010	2.5 × 6.5 × 7.3	B32529C6102+***	12800	11200	8000
		0.0015	2.5 × 6.5 × 7.3	B32529C6152+***	12800	11200	8000
		0.0022	2.5 × 6.5 × 7.3	B32529C6222+***	12800	11200	8000
		0.0033	2.5 × 6.5 × 7.3	B32529C6332+***	12800	11200	8000
		0.0047	2.5 × 6.5 × 7.3	B32529C6472+***	12800	11200	8000
		0.0068	2.5 × 6.5 × 7.3	B32529C6682+***	12800	11200	8000
		0.010	3.0 × 6.5 × 7.3	B32529E6103+***	10800	9600	8000
		0.015	3.0 × 6.5 × 7.3	B32529E6153+***	10800	9600	8000
		0.022	3.5 × 8.0 × 7.3	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 × 7.3	B32529C8102+***	12800	11200	8000
		0.0015	2.5 × 6.5 × 7.3	B32529C8152+***	12800	11200	8000
		0.0022	2.5 × 6.5 × 7.3	B32529C8222+***	12800	11200	8000
		0.0033	3.5 × 8.0 × 7.3	B32529C8332+***	9200	8000	8000
		0.0047	3.5 × 8.0 × 7.3	B32529C8472+***	9200	8000	8000
		0.0068	3.5 × 8.0 × 7.3	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%

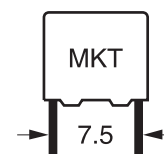
J = ±5%

\*\*\* = Packaging code:

289 = Ammo pack

189 = Reel

000 = Untaped (standard lead length 6 – 1 mm)


**Ordering codes and packing units (lead spacing 7.5 mm)**

$V_R$	$V_{RMS}$ $f \leq 60$ Hz	$C_R$	Max. dimensions $w \times h \times l$ mm	Ordering code (composition see below)	Ammo pack pcs./MOQ	Reel pcs./MOQ	Untaped pcs./MOQ
V DC	V AC	$\mu F$					
63	40	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	0.15	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	0.068	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
400	200	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 (standard lead length 6 – 1 mm)


**B32521**
**General purpose (stacked/wound)**
**Ordering codes and packing units (lead spacing 10 mm)**

$V_R$	$V_{RMS}$ $f \leq 60$ Hz	$C_R$	Max. dimensions $w \times h \times l$ mm	Ordering code (composition see below)	Ammo pack pcs./MOQ	Reel pcs./MOQ	Untaped pcs./MOQ
V DC	V AC	$\mu F$					
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	0.047	4.0 × 7.0 × 13.0	B32521C1473+***	4000	6800	4000
		0.068	4.0 × 7.0 × 13.0	B32521C1683+***	4000	6800	4000
		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	0.010	4.0 × 7.0 × 13.0	B32521C3103+***	4000	6800	4000
		0.015	4.0 × 7.0 × 13.0	B32521C3153+***	4000	6800	4000
		0.022	4.0 × 7.0 × 13.0	B32521C3223+***	4000	6800	4000
		0.033	4.0 × 7.0 × 13.0	B32521C3333+***	4000	6800	4000
		0.047	4.0 × 7.0 × 13.0	B32521C3473+***	4000	6800	4000
		0.056	4.0 × 7.0 × 13.0	B32521C3563+***	4000	6800	4000
		0.068	4.0 × 7.0 × 13.0	B32521C3683+***	4000	6800	4000
		0.082	4.0 × 7.0 × 13.0	B32521C3823+***	4000	6800	4000
		0.10	4.0 × 7.0 × 13.0	B32521C3104+***	4000	6800	4000
		0.12	4.0 × 9.0 × 13.0	B32521C3124+***	4000	6800	4000
		0.15	4.0 × 9.0 × 13.0	B32521C3154+***	4000	6800	4000
		0.18	5.0 × 11.0 × 13.0	B32521C3184+***	3320	5200	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

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 (standard lead length 6 – 1 mm)


**Ordering codes and packing units (lead spacing 10 mm)**

$V_R$	$V_{RMS}$ $f \leq 60$ Hz	$C_R$	Max. dimensions $w \times h \times l$ mm	Ordering code (composition see below)	Ammo pack pcs./MOQ	Reel pcs./MOQ	Untaped pcs./MOQ
V DC	V AC	$\mu F$					
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
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 =  $\pm 20\%$

K =  $\pm 10\%$

J =  $\pm 5\%$

\*\*\* = Packaging code:

289 = Ammo pack

189 = Reel

000 = Untaped (standard lead length 6 – 1 mm)


**B32522**
**General purpose (stacked/wound)**
**Ordering codes and packing units (lead spacing 15 mm)**

$V_R$	$V_{RMS}$ $f \leq 60$ Hz	$C_R$	Max. dimensions $w \times h \times l$ mm	Ordering code (composition see below)	Ammo pack pcs./MOQ	Reel pcs./ MOQ	Untaped pcs./ MOQ
V DC	V AC	$\mu F$					
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
6.8	11.0 × 18.5 × 18.0	B32522C1685+***	–	–	1200		
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
		0.39	5.0 × 10.5 × 18.0	B32522C3394+***	4680	5200	4000
		0.47	6.0 × 11.0 × 18.0	B32522C3474+***	3840	4400	4000
		0.56	7.0 × 12.5 × 18.0	B32522C3564+***	3320	3600	4000

▽ 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 (standard lead length 6 – 1 mm)


**Ordering codes and packing units (lead spacing 15 mm)**

$V_R$	$V_{RMS}$ $f \leq 60$ Hz	$C_R$	Max. dimensions $w \times h \times l$ mm	Ordering code (composition see below)	Ammo pack pcs./MOQ	Reel pcs./ MOQ	Untaped pcs./ MOQ
V DC	V AC	$\mu F$					
250	160	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
		2.2	11.0 × 18.5 × 18.0	B32522C3225+***	—	—	1200
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
		0.39	9.0 × 17.5 × 18.0	B32522E6394+***	2560	2800	2000
		0.47	9.0 × 17.5 × 18.0	B32522E6474+***	2560	2800	2000
		0.56	9.0 × 17.5 × 18.0	B32522E6564+***	2560	2800	2000
		0.68	9.0 × 17.5 × 18.0	B32522E6684+***	2560	2800	2000
		1.0	11.0 × 18.5 × 18.0	B32522E6105+***	—	—	1200
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
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 (standard lead length 6 – 1 mm)


**B32523**
**General purpose (wound)**
**Ordering codes and packing units (lead spacing 22.5 mm)**

$V_R$	$V_{RMS}$ $f \leq 60$ Hz	$C_R$	Max. dimensions $w \times h \times l$ mm	Ordering code (composition see below)	Ammo pack pcs./MOQ	Reel pcs./MOQ	Untaped pcs./MOQ
V DC	V AC	$\mu F$					
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	2520
		6.8	8.5 × 16.5 × 26.5	B32523Q1685+***	1960	2000	2040
		10	10.5 × 18.5 × 26.5	B32523Q1106+***	1560	1600	2160
250	160	15	12.0 × 22.0 × 26.5	B32523Q1156+***	—	—	1800
		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
400	200	3.3	11.0 × 20.5 × 26.5	B32523Q3335+***	1480	1400	2040
		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
630	200	1.5	11.0 × 20.5 × 26.5	B32523Q6155+***	1480	1400	2040
		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 (standard lead length 6 – 1 mm)


**Ordering codes and packing units (lead spacing 27.5 mm)**

$V_R$	$V_{RMS}$ $f \leq 60$ Hz	$C_R$	Max. dimensions $w \times h \times l$ mm	Ordering code (composition see below)	Ammo pack pcs./MOQ	Reel pcs./MOQ	Untaped pcs./MOQ
V DC	V AC	$\mu F$					
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	B32524R3156M***	—	—	960
		15	18.0 × 27.5 × 31.5	B32524R3156J***	—	—	960
		15	18.0 × 27.5 × 31.5	B32524R3156K***	—	—	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 (standard lead length 6 – 1 mm)



**B32524**

**General purpose (wound)**

**Ordering codes and packing units (lead spacing 27.5 mm)**

$V_R$	$V_{RMS}$ $f \leq 60$ Hz	$C_R$	Max. dimensions $w \times h \times l$	Ordering code (composition see below)	Ammo pack pcs./MOQ	Reel pcs./MOQ	Untaped pcs./MOQ
V DC	V AC	$\mu F$	mm				
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 (standard lead length 6 – 1 mm)


**Ordering codes and packing units (lead spacing 37.5 mm)**

$V_R$	$V_{RMS}$ $f \leq 60$ Hz	$C_R$	Max. dimensions $w \times h \times l$ mm	Ordering code (composition see below)	Ammo pack pcs./MOQ	Reel pcs./MOQ	Untaped pcs./MOQ
V DC	V AC	$\mu F$					
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  $\mu F$  type only)

\*\*\* = Packaging code:

000 = Untaped (standard lead length 6 – 1 mm)



**B32526**

**General purpose (wound)**

**Ordering codes and packing units (lead spacing 37.5 mm)**

$V_R$	$V_{RMS}$ $f \leq 60$ Hz	$C_R$	Max. dimensions $w \times h \times l$ mm	Ordering code (composition see below)	Ammo pack pcs./MOQ	Reel pcs./MOQ	Untaped pcs./MOQ
V DC	V AC	$\mu F$					
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  $\mu F$  type only)

\*\*\* = Packaging code:

000 = Untaped (standard lead length 6 – 1 mm)

**Technical data**

Reference standard: IEC 61071:2007. AEC-Q200D compliance on request. All data given at  $T = 20\text{ °C}$ , unless otherwise specified.

Rated temperature $T_R$	+85 °C			
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 $\tan \delta$ (in $10^{-3}$ ) at 20 °C (upper limit values)	at	$C_R \leq 0.1\ \mu\text{F}$	$0.1\ \mu\text{F} < C_R \leq 1\ \mu\text{F}$	$C_R > 1\ \mu\text{F}$
	1 kHz	8	8	10
	10 kHz	15	15	—
	100 kHz	30	—	—
Insulation resistance $R_{ins}$ or time constant $\tau = C_R \cdot R_{ins}$ at 20 °C, rel. humidity $\leq 65\%$ (minimum as-delivered values)	$V_R$	$C_R \leq 0.33\ \mu\text{F}$		$C_R > 0.33\ \mu\text{F}$
	$\leq 100\ \text{V DC}$	3750 M $\Omega$		1250 s
	$\geq 250\ \text{V DC}$	7500 M $\Omega$		2500 s
DC test voltage	$1.4 \cdot V_R, 2\ \text{s}$			
Category voltage $V_C$ (continuous operation with $V_{DC}$ or $V_{AC}$ at $f \leq 60\ \text{Hz}$ )	$T_{op}$ (°C)	DC voltage derating	AC voltage derating	
	$T_{op} \leq 85$	$V_C = V_R$	$V_{C,RMS} = V_{RMS}$	
	$85 < T_{op} \leq 125$	$V_C = V_R \cdot (165 - T_{op})/80$	$V_{C,RMS} = V_{RMS} \cdot (165 - T_{op})/80$	
Operating voltage $V_{op}$ for short operating periods ( $V_{DC}$ or $V_{AC}$ at $f \leq 60\ \text{Hz}$ )	$T_{op}$ (°C)	DC voltage (max. hours)	AC voltage (max. hours)	
	$T_{op} \leq 100$	$V_{op} = 1.25 \cdot V_C$ (2000 h)	$V_{op} = 1.0 \cdot V_{C,RMS}$ (2000 h)	
	$100 < T_{op} \leq 125$	$V_{op} = 1.25 \cdot V_C$ (1000 h)	$V_{op} = 1.0 \cdot V_{C,RMS}$ (1000 h)	
Biased humidity Limit value after biased humidity test	1000 h / 40 °C / 93% relative humidity with $V_{R,DC}$			
	Capacitance change $ \Delta C/C $	$\leq 5\%$		
	Dissipation factor change $\Delta \tan \delta$	$\leq 5 \cdot 10^{-3}$ (at 1 kHz)		
	Insulation resistance $R_{ins}$ or time constant $\tau = C_R \cdot R_{ins}$	$\geq 50\%$ of minimum as-delivered values		
Reliability:				
Failure rate $\lambda$	1 fit ( $\leq 1 \cdot 10^{-9}/\text{h}$ ) at $0.5 \cdot V_R, 40\text{ °C}$			
Service life $t_{SL}$	200 000 h at $1.0 \cdot V_R, 85\text{ °C}$			
Failure criteria:	For conversion to other operating conditions and temperatures, refer to chapter "Quality, 2 Reliability".			
Total failure	Short circuit or open circuit			
Failure due to variation of parameters	Capacitance change $ \Delta C/C $	$> 10\%$		
	Dissipation factor $\tan \delta$	$> 2 \cdot$ upper limit value		
	Insulation resistance $R_{ins}$ or time constant $\tau = C_R \cdot R_{ins}$	$< 150\ \text{M}\Omega$ ( $C_R \leq 0.33\ \mu\text{F}$ ) $< 50\ \text{s}$ ( $C_R > 0.33\ \mu\text{F}$ )		



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General purpose (stacked/wound)

### Pulse handling capability

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

"k<sub>0</sub>" represents the maximum permissible pulse characteristic of the waveform applied to the capacitor, expressed in V<sup>2</sup>/ $\mu$ s.

Note:

The values of dV/dt and k<sub>0</sub> 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 <sub>R</sub> V DC	V <sub>RMS</sub> V AC	dV/dt in V/ $\mu$ s								
50	32	200	–	–	–	–	–	–	–	–
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<sub>0</sub> 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 <sub>R</sub> V DC	V <sub>RMS</sub> V AC	k <sub>0</sub> in V <sup>2</sup> / $\mu$ s								
50	32	20000	–	–	–	–	–	–	–	–
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)





**B32529**

**General purpose (stacked)**

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

For  $T_A > 55^\circ C$ , 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



**B32529**

**General purpose (stacked)**



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

For  $T_A > 55^\circ C$ , 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





**B32520**

**General purpose (stacked)**

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

For  $T_A > 55^\circ C$ , 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



**B32521**

**General purpose (stacked/wound)**



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

For  $T_A > 55^\circ C$ , 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





**B32521**

**General purpose (stacked/wound)**

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

For  $T_A > 55^\circ\text{C}$ , please refer to "General technical information", section 3.2.3.

**Lead spacing 10 mm**

630 V DC/200 V AC



B32522

General purpose (stacked/wound)



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

For  $T_A > 55^\circ C$ , 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





**B32522**

**General purpose (stacked/wound)**

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

For  $T_A > 55^\circ C$ , 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



B32523

General purpose (wound)



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

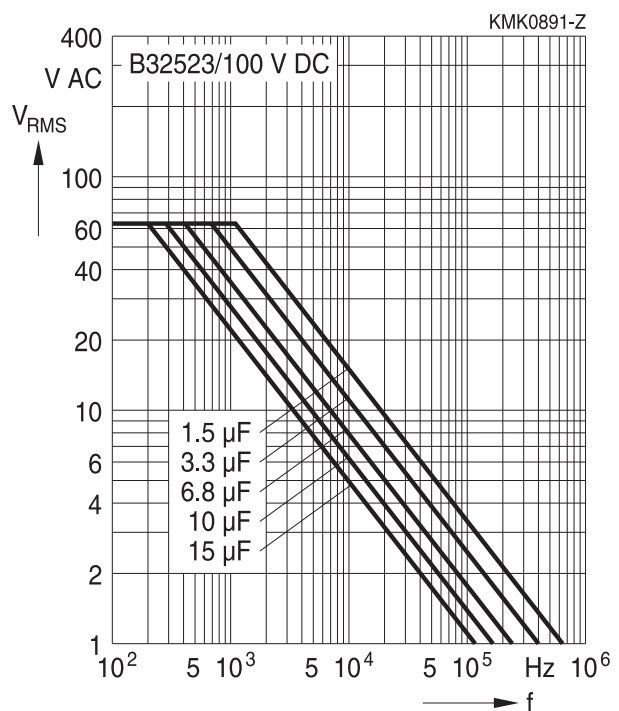
For  $T_A > 55^\circ C$ , please refer to "General technical information", section 3.2.3.

**Lead spacing 22.5 mm**

63 V DC/40 V AC



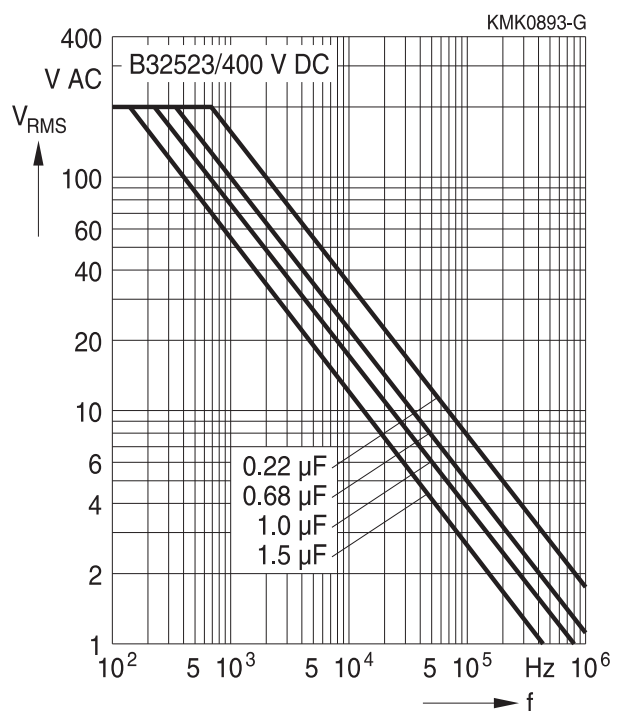
100 V DC/63 V AC



250 V DC/160 V AC



400 V DC/200 V AC





**B32523**

**General purpose (wound)**

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

For  $T_A > 55\text{ °C}$ , please refer to "General technical information", section 3.2.3.

**Lead spacing 22.5 mm**

630 V DC/200 V AC



**B32524**

**General purpose (wound)**



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

For  $T_A > 55^\circ C$ , 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**





**B32524**

**General purpose (wound)**

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

For  $T_A > 55^\circ\text{C}$ , please refer to "General technical information", section 3.2.3.

**Lead spacing 27.5 mm**

630 V DC/220 V AC



**B32526**

**General purpose (wound)**



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

For  $T_A > 55^\circ C$ , 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**





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General purpose (stacked/wound)

## Mounting guidelines

### 1 Soldering

#### 1.1 Solderability of leads

The solderability of terminal leads is tested to IEC 60068-2-20:2008, test Ta, method 1.

Before a solderability test is carried out, terminals are subjected to accelerated ageing (to IEC 60068-2-2:2007, 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 60068-2-20:2008, test Tb, method 1.

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)	260 ±5 °C	5 ±1 s
MKP (lead spacing ≤7.5 mm)		<4 s
MKT uncoated (lead spacing ≤10 mm) insulated (B32559)		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
$\tan \delta$	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



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General purpose (stacked/wound)

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 recommendations

As a reference, the recommended wave soldering profile for our film capacitors is as follows:



$T_s$ : Capacitor body maximum temperature at wave soldering

$T_p$ : Capacitor body maximum temperature at pre-heating

KMK1745-A-E



KMK1744-9-E



Body temperature should follow the description below:

- MKP capacitor
  - During pre-heating:  $T_p \leq 110 \text{ }^\circ\text{C}$
  - During soldering:  $T_s \leq 120 \text{ }^\circ\text{C}$ ,  $t_s \leq 45 \text{ s}$
- MKT capacitor
  - During pre-heating:  $T_p \leq 125 \text{ }^\circ\text{C}$
  - During soldering:  $T_s \leq 160 \text{ }^\circ\text{C}$ ,  $t_s \leq 45 \text{ s}$

When SMD components are used together with leaded ones, the 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.

In order to ensure proper conditions for manual or selective soldering, the body temperature of the capacitor ( $T_s$ ) must be  $\leq 120 \text{ }^\circ\text{C}$ .

One recommended condition for manual soldering is that the tip of the soldering iron should be  $< 360 \text{ }^\circ\text{C}$  and the soldering contact time should be no longer than 3 seconds.

For uncoated MKT capacitors with lead spacings  $\leq 10 \text{ mm}$  (B32560/B32561) the following measures are recommended:

- pre-heating to not more than  $110 \text{ }^\circ\text{C}$  in the preheater phase
- rapid cooling after soldering

Please refer to EPCOS Film Capacitor Data Book in case more details are needed.



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General purpose (stacked/wound)

### 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.
- Consult us if application is with severe temperature and humidity condition.
- There are no serviceable or repairable parts inside the capacitor. Opening the capacitor or any attempts to open or repair the capacitor will void the warranty and liability of EPCOS.
- Please note that the standards referred to in this publication may have been revised in the meantime.

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 60068-2-6:2007. 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"



Topic	Safety information	Reference chapter "Mounting guidelines"
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"

### Display of ordering codes for EPCOS products

The ordering code for one and the same product can be represented differently in data sheets, data books, other publications and the website of EPCOS, or in order-related documents such as shipping notes, order confirmations and product labels. **The varying representations of the ordering codes are due to different processes employed and do not affect the specifications of the respective products.** Detailed information can be found on the Internet under [www.epcos.com/orderingcodes](http://www.epcos.com/orderingcodes).



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General purpose (stacked/wound)

## Symbols and terms

Symbol	English	German
$\alpha$	Heat transfer coefficient	Wärmeübergangszahl
$\alpha_C$	Temperature coefficient of capacitance	Temperaturkoeffizient der Kapazität
A	Capacitor surface area	Kondensatoroberfläche
$\beta_C$	Humidity coefficient of capacitance	Feuchtekoeffizient der Kapazität
C	Capacitance	Kapazität
$C_R$	Rated capacitance	Nennkapazität
$\Delta C$	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
$\Delta t$	Time interval	Zeitintervall
$\Delta T$	Absolute temperature change (self-heating)	Absolute Temperaturänderung (Selbsterwärmung)
$\Delta \tan \delta$	Absolute change of dissipation factor	Absolute Änderung des Verlustfaktors
$\Delta V$	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)



General purpose (stacked/wound)

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	Impuls Kennwert
$L_S$	Series inductance	Serieninduktivität
$\lambda$	Failure rate	Ausfallrate
$\lambda_0$	Constant failure rate during useful service life	Konstante Ausfallrate in der Nutzungsphase
$\lambda_{test}$	Failure rate, determined by tests	Experimentell ermittelte Ausfallrate
$P_{diss}$	Dissipated power	Abgegebene Verlustleistung
$P_{gen}$	Generated power	Erzeugte Verlustleistung
$Q$	Heat energy	Wärmeenergie
$\rho$	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
$\tau$	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 Verlustfaktors
$\tan \delta_S$	Series component of dissipation factor	Serienanteil des Verlustfaktors
$T_A$	Temperature of the air surrounding the component	Temperatur der Luft, die das Bauteil umgibt
$T_{max}$	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, $T_A + \Delta T$	Betriebstemperatur, $T_A + \Delta T$
$T_R$	Rated temperature	Nenntemperatur
$T_{ref}$	Reference temperature	Referenztemperatur
$t_{SL}$	Reference service life	Referenz-Lebensdauer



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General purpose (stacked/wound)

Symbol	English	German
$V_{AC}$	AC voltage	Wechselspannung
$V_C$	Category voltage	Kategorie <span>spannung</span>
$V_{C,RMS}$	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	Ausgangsspannung
$V_{op}$	Operating voltage	Betriebsspannung
$V_p$	Peak pulse voltage	Impuls-Spitzen <span>spannung</span>
$V_{pp}$	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
$e$	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](http://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)**.



## Important notes

7. **Our manufacturing sites serving the automotive business apply the IATF 16949 standard.** The IATF certifications confirm our compliance with requirements regarding the quality management system in the automotive industry. Referring to customer requirements and customer specific requirements (“CSR”) TDK always has and will continue to have the policy of respecting individual agreements. Even if IATF 16949 may appear to support the acceptance of unilateral requirements, we hereby like to emphasize that **only requirements mutually agreed upon can and will be implemented in our Quality Management System.** For clarification purposes we like to point out that obligations from IATF 16949 shall only become legally binding if individually agreed upon.
8. The trade names EPCOS, CeraCharge, CeraDiode, CeraLink, CeraPad, CeraPlas, CSMP, CTVS, DeltaCap, DigiSiMic, ExoCore, FilterCap, FormFit, LeaXield, MiniBlue, MiniCell, MKD, MKK, MotorCap, PCC, PhaseCap, PhaseCube, PhaseMod, PhiCap, PowerHap, PQSine, PQvar, SIFERRIT, SIFI, SIKOREL, SilverCap, SIMDAD, SiMic, SIMID, SineFormer, SIOV, 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](http://www.epcos.com/trademarks).

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