

Film Capacitors

Metallized Polyester Film Capacitors (MKT)

Series/Type: B32520 ... B32529

Date: April 2015

© EPCOS AG 2015. Reproduction, publication and dissemination of this publication, enclosures hereto and the information contained therein without EPCOS' prior express consent is prohibited.

EPCOS AG is a TDK Group Company.

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
- RoHS-compatible
- Halogen-free capacitors available on request

Terminals

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

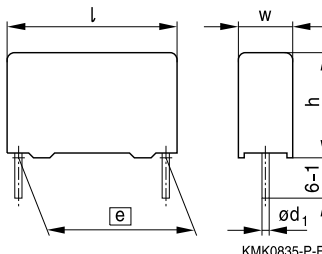
Marking

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 ≥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

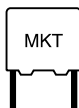
Lead spacing $e \pm 0.4$	Lead diameter $d_1 \pm 0.05$	Type
5.0	0.5	B32529
7.5	0.5	B32520
10.0	0.6 ¹⁾	B32521
15.0	0.8	B32522
22.5	0.8	B32523
27.5	0.8	B32524
37.5	1.0	B32526

1) 0.5 mm for capacitor width $w = 4$ mm

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 (μF)															
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



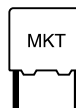
B32520 ... B32529

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	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																	
0.39																	
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																	

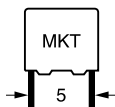
Technology: s = Stacked-film technology / w = Wound capacitor technology



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 (μF)				
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} $f \leq 60 \text{ Hz}$	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	μF					
50	32	3.3 4.7	$7.8 \times 13.0 \times 7.8$ $7.8 \times 13.0 \times 7.8$	B32529D5335+*** B32529D5475M***	4000 4000	3200 3200	4000 4000
63	40	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	$2.5 \times 6.5 \times 7.3$ $2.5 \times 6.5 \times 7.3$ $2.5 \times 6.5 \times 7.3$ $2.5 \times 6.5 \times 7.3$ $2.5 \times 6.5 \times 7.3$ $2.5 \times 6.5 \times 7.3$ $2.5 \times 6.5 \times 7.3$ $2.5 \times 6.5 \times 7.3$ $2.5 \times 6.5 \times 7.3$ $2.5 \times 6.5 \times 7.3$ $2.5 \times 6.5 \times 7.3$ $2.5 \times 6.5 \times 7.3$ $2.5 \times 6.5 \times 7.3$ $2.5 \times 6.5 \times 7.3$ $2.5 \times 6.5 \times 7.3$ $3.0 \times 6.5 \times 7.3$ $3.5 \times 8.0 \times 7.3$ $4.5 \times 9.5 \times 7.3$ $4.5 \times 9.5 \times 7.3$ $6.0 \times 10.5 \times 7.5$ $7.8 \times 13.0 \times 7.8$	B32529C0102+*** B32529C0152+*** B32529C0222+*** B32529C0332+*** B32529C0472+*** B32529C0682+*** B32529C0103+*** B32529C0153+*** B32529C0223+*** B32529C0333+*** B32529C0473+*** B32529C0683+*** B32529C0104+*** B32529C0154+*** B32529C0224+*** B32529C0334+*** B32529C0474+*** B32529C0684+*** B32529C0105+*** B32529C0155+*** B32529D0225+***	12800 12800 12800 12800 12800 12800 12800 12800 12800 12800 12800 12800 12800 12800 12800 10800 9200 7200 7200 5200 4000	11200 11200 11200 11200 11200 11200 11200 11200 11200 11200 11200 11200 11200 11200 11200 9600 8000 6000 6000 6000 3200	8000 8000
100	63	0.0010 0.0015 0.0022 0.0033 0.0047 0.0068 0.010 0.015	$2.5 \times 6.5 \times 7.3$ $2.5 \times 6.5 \times 7.3$ $2.5 \times 6.5 \times 7.3$ $2.5 \times 6.5 \times 7.3$ $2.5 \times 6.5 \times 7.3$ $2.5 \times 6.5 \times 7.3$ $2.5 \times 6.5 \times 7.3$ $2.5 \times 6.5 \times 7.3$	B32529C1102+*** B32529C1152+*** B32529C1222+*** B32529C1332+*** B32529C1472+*** B32529C1682+*** B32529C1103+*** B32529C1153+***	12800 12800 12800 12800 12800 12800 12800 12800	11200 11200 11200 11200 11200 11200 11200 11200	8000 8000 8000 8000 8000 8000 8000 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 = $\pm 20\%$

K = $\pm 10\%$

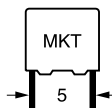
J = $\pm 5\%$

*** = 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} $f \leq 60 \text{ Hz}$	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	μF					
100	63	0.022	$2.5 \times 6.5 \times 7.3$	B32529C1223+***	12800	11200	8000
		0.033	$2.5 \times 6.5 \times 7.3$	B32529C1333+***	12800	11200	8000
		0.047	$2.5 \times 6.5 \times 7.3$	B32529C1473+***	12800	11200	8000
		0.068	$2.5 \times 6.5 \times 7.3$	B32529C1683+***	12800	11200	8000
		0.10	$2.5 \times 6.5 \times 7.3$	B32529C1104+***	12800	11200	8000
		0.15	$3.0 \times 6.5 \times 7.3$	B32529C1154+***	10800	9600	8000
		0.22	$3.5 \times 8.0 \times 7.3$	B32529C1224+***	9200	8000	8000
		0.33	$3.5 \times 8.0 \times 7.3$	B32529C1334+***	9200	8000	8000
		0.47	$4.5 \times 9.5 \times 7.3$	B32529C1474+***	7200	6000	6000
		0.68	$6.0 \times 10.5 \times 7.5$	B32529C1684+***	5200	4400	4000
		1.0	$7.8 \times 13.0 \times 7.8$	B32529D1105+***	4000	3200	4000
250	160	0.0010	$2.5 \times 6.5 \times 7.3$	B32529C3102+***	12800	11200	8000
		0.0015	$2.5 \times 6.5 \times 7.3$	B32529C3152+***	12800	11200	8000
		0.0022	$2.5 \times 6.5 \times 7.3$	B32529C3222+***	12800	11200	8000
		0.0033	$2.5 \times 6.5 \times 7.3$	B32529C3332+***	12800	11200	8000
		0.0047	$2.5 \times 6.5 \times 7.3$	B32529C3472+***	12800	11200	8000
		0.0068	$2.5 \times 6.5 \times 7.3$	B32529C3682+***	12800	11200	8000
		0.010	$2.5 \times 6.5 \times 7.3$	B32529C3103+***	12800	11200	8000
		0.015	$2.5 \times 6.5 \times 7.3$	B32529C3153+***	12800	11200	8000
		0.022	$2.5 \times 6.5 \times 7.3$	B32529C3223+***	12800	11200	8000
		0.033	$3.0 \times 6.5 \times 7.3$	B32529C3333+***	10800	9600	8000
		0.047	$3.5 \times 8.0 \times 7.3$	B32529C3473+***	9200	8000	8000
		0.068	$4.5 \times 9.5 \times 7.3$	B32529C3683+***	7200	6000	6000
		0.10	$4.5 \times 9.5 \times 7.3$	B32529C3104+***	7200	6000	6000
		0.15	$5.0 \times 10.0 \times 7.5$	B32529C3154+***	6400	5600	6000
		0.22	$7.8 \times 13.0 \times 7.8$	B32529D3224+***	4000	3200	4000
		0.33	$7.8 \times 13.0 \times 7.8$	B32529C3334+***	4000	3200	4000
		0.47	$7.8 \times 13.0 \times 7.8$	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 = $\pm 20\%$

K = $\pm 10\%$

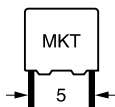
J = $\pm 5\%$

*** = 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} $f \leq 60 \text{ Hz}$	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	μF					
400	200	0.0010	$2.5 \times 6.5 \times 7.3$	B32529C6102+***	12800	11200	8000
		0.0015	$2.5 \times 6.5 \times 7.3$	B32529C6152+***	12800	11200	8000
		0.0022	$2.5 \times 6.5 \times 7.3$	B32529C6222+***	12800	11200	8000
		0.0033	$2.5 \times 6.5 \times 7.3$	B32529C6332+***	12800	11200	8000
		0.0047	$2.5 \times 6.5 \times 7.3$	B32529C6472+***	12800	11200	8000
		0.0068	$2.5 \times 6.5 \times 7.3$	B32529C6682+***	12800	11200	8000
		0.010	$3.0 \times 6.5 \times 7.3$	B32529E6103+***	10800	9600	8000
		0.015	$3.0 \times 6.5 \times 7.3$	B32529E6153+***	10800	9600	8000
		0.022	$3.5 \times 8.0 \times 7.3$	B32529E6223+***	9200	8000	8000
		0.033	$4.5 \times 9.5 \times 7.3$	B32529E6333+***	7200	6000	6000
		0.047	$4.5 \times 9.5 \times 7.3$	B32529E6473+***	7200	6000	6000
		0.068	$6.0 \times 10.5 \times 7.5$	B32529E6683+***	5200	4400	4000
		0.10	$7.8 \times 13.0 \times 7.8$	B32529E6104+***	4000	3200	4000
		0.15	$7.8 \times 13.0 \times 7.8$	B32529E6154+***	4000	3200	4000
630	400	0.0010	$2.5 \times 6.5 \times 7.3$	B32529C8102+***	12800	11200	8000
		0.0015	$2.5 \times 6.5 \times 7.3$	B32529C8152+***	12800	11200	8000
		0.0022	$2.5 \times 6.5 \times 7.3$	B32529C8222+***	12800	11200	8000
		0.0033	$3.5 \times 8.0 \times 7.3$	B32529C8332+***	9200	8000	8000
		0.0047	$3.5 \times 8.0 \times 7.3$	B32529C8472+***	9200	8000	8000
		0.0068	$3.5 \times 8.0 \times 7.3$	B32529C8682+***	9200	8000	8000
		0.010	$5.0 \times 10.0 \times 7.5$	B32529C8103+***	6400	5600	6000
		0.015	$5.0 \times 10.0 \times 7.5$	B32529C8153+***	6400	5600	6000
		0.022	$7.8 \times 13.0 \times 7.8$	B32529C8223+***	5200	4400	4000
		0.033	$7.8 \times 13.0 \times 7.8$	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 = $\pm 20\%$

K = $\pm 10\%$

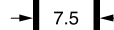
J = $\pm 5\%$

*** = 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} $f \leq 60 \text{ Hz}$	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	μF					
63	40	0.47	$3.0 \times 8.0 \times 10.0$	B32520C0474+***	10400	9600	8000
		0.68	$4.0 \times 8.5 \times 10.0$	B32520C0684+***	8000	7200	6000
		1.0	$5.0 \times 10.5 \times 10.0$	B32520C0105+***	6400	5600	4000
		1.5	$5.0 \times 10.5 \times 10.0$	B32520C0155+***	6400	5600	4000
		2.2	$6.0 \times 12.0 \times 10.3$	B32520C0225+***	5200	4400	3000
100	63	0.15	$3.0 \times 8.0 \times 10.0$	B32520C1154+***	10400	9600	8000
		0.22	$3.0 \times 8.0 \times 10.0$	B32520C1224+***	10400	9600	8000
		0.33	$4.0 \times 8.5 \times 10.0$	B32520C1334+***	8000	7200	6000
		0.47	$5.0 \times 10.5 \times 10.0$	B32520C1474+***	6400	5600	4000
		0.68	$6.0 \times 12.0 \times 10.3$	B32520C1684+***	5200	4400	3000
250	160	0.10	$4.0 \times 8.5 \times 10.0$	B32520C3104+***	8000	7200	6000
		0.15	$5.0 \times 10.5 \times 10.0$	B32520C3154+***	6400	5600	4000
		0.22	$6.0 \times 12.0 \times 10.3$	B32520C3224+***	5200	4400	3000
400	200	0.015	$3.0 \times 8.0 \times 10.0$	B32520E6153+***	10400	9600	8000
		0.022	$3.0 \times 8.0 \times 10.0$	B32520E6223+***	10400	9600	8000
		0.033	$4.0 \times 8.5 \times 10.0$	B32520E6333+***	8000	7200	6000
		0.047	$4.0 \times 8.5 \times 10.0$	B32520E6473+***	8000	7200	6000
		0.068	$5.0 \times 10.5 \times 10.0$	B32520E6683+***	6400	5600	4000
		0.10	$5.0 \times 10.5 \times 10.0$	B32520E6104+***	6400	5600	4000
		0.15	$6.0 \times 12.0 \times 10.3$	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 = $\pm 20\%$

K = $\pm 10\%$

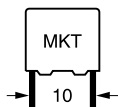
J = $\pm 5\%$

*** = 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} $f \leq 60 \text{ Hz}$	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	μF					
63	40	0.47	$4.0 \times 7.0 \times 13.0$	B32521C0474+***	4000	6800	4000
		0.68	$4.0 \times 7.0 \times 13.0$	B32521C0684+***	4000	6800	4000
		1.0	$4.0 \times 9.0 \times 13.0$	B32521C0105+***	4000	6800	4000
		1.5	$5.0 \times 11.0 \times 13.0$	B32521C0155+***	3320	5200	4000
		2.2	$5.0 \times 11.0 \times 13.0$	B32521C0225+***	3320	5200	4000
		3.3	$6.0 \times 12.0 \times 13.0$	B32521C0335+***	2720	4400	4000
100	63	0.047	$4.0 \times 7.0 \times 13.0$	B32521C1473+***	4000	6800	4000
		0.068	$4.0 \times 7.0 \times 13.0$	B32521C1683+***	4000	6800	4000
		0.10	$4.0 \times 7.0 \times 13.0$	B32521C1104+***	4000	6800	4000
		0.15	$4.0 \times 7.0 \times 13.0$	B32521C1154+***	4000	6800	4000
		0.22	$4.0 \times 7.0 \times 13.0$	B32521C1224+***	4000	6800	4000
		0.33	$4.0 \times 7.0 \times 13.0$	B32521C1334+***	4000	6800	4000
		0.47	$4.0 \times 9.0 \times 13.0$	B32521C1474+***	4000	6800	4000
		0.68	$5.0 \times 11.0 \times 13.0$	B32521C1684+***	3320	5200	4000
250	160	1.0	$6.0 \times 12.0 \times 13.0$	B32521C1105+***	2720	4400	4000
		0.010	$4.0 \times 7.0 \times 13.0$	B32521C3103+***	4000	6800	4000
		0.015	$4.0 \times 7.0 \times 13.0$	B32521C3153+***	4000	6800	4000
		0.022	$4.0 \times 7.0 \times 13.0$	B32521C3223+***	4000	6800	4000
		0.033	$4.0 \times 7.0 \times 13.0$	B32521C3333+***	4000	6800	4000
		0.047	$4.0 \times 7.0 \times 13.0$	B32521C3473+***	4000	6800	4000
		0.056	$4.0 \times 7.0 \times 13.0$	B32521C3563+***	4000	6800	4000
		0.068	$4.0 \times 7.0 \times 13.0$	B32521C3683+***	4000	6800	4000
		0.082	$4.0 \times 7.0 \times 13.0$	B32521C3823+***	4000	6800	4000
		0.10	$4.0 \times 7.0 \times 13.0$	B32521C3104+***	4000	6800	4000
		0.12	$4.0 \times 9.0 \times 13.0$	B32521C3124+***	4000	6800	4000
		0.15	$4.0 \times 9.0 \times 13.0$	B32521C3154+***	4000	6800	4000
		0.18	$5.0 \times 11.0 \times 13.0$	B32521C3184+***	3320	5200	4000
		0.22	$5.0 \times 11.0 \times 13.0$	B32521C3224+***	3320	5200	4000
		0.33	$5.0 \times 11.0 \times 13.0$	B32521C3334+***	3320	5200	4000
		0.47	$6.0 \times 12.0 \times 13.0$	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 = $\pm 20\%$

K = $\pm 10\%$

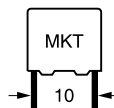
J = $\pm 5\%$

*** = 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} $f \leq 60 \text{ Hz}$	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	μF					
400	200	0.010	$4.0 \times 7.0 \times 13.0$	B32521E6103+***	4000	6800	4000
		0.015	$4.0 \times 7.0 \times 13.0$	B32521E6153+***	4000	6800	4000
		0.022	$4.0 \times 7.0 \times 13.0$	B32521E6223+***	4000	6800	4000
		0.033	$4.0 \times 7.0 \times 13.0$	B32521E6333+***	4000	6800	4000
		0.047	$4.0 \times 9.0 \times 13.0$	B32521E6473+***	4000	6800	4000
		0.068	$4.0 \times 9.0 \times 13.0$	B32521E6683+***	4000	6800	4000
		0.10	$5.0 \times 11.0 \times 13.0$	B32521E6104+***	3320	5200	4000
		0.15	$6.0 \times 12.0 \times 13.0$	B32521E6154+***	2720	4400	4000
630	200	0.010	$4.0 \times 9.0 \times 13.0$	B32521D8103+***	—	6800	4000
		0.015	$5.0 \times 11.0 \times 13.0$	B32521D8153+***	—	6800	4000
		0.022	$5.0 \times 11.0 \times 13.0$	B32521D8223+***	—	5200	4000
		0.033	$6.0 \times 12.0 \times 13.0$	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 = $\pm 10\%$

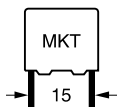
J = $\pm 5\%$

*** = 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} $f \leq 60 \text{ Hz}$	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	μF					
63	40	0.68	$5.0 \times 10.5 \times 18.0$	B32522C0684+***	4680	5200	4000
		1.0	$5.0 \times 10.5 \times 18.0$	B32522C0105+***	4680	5200	4000
		1.5	$5.0 \times 10.5 \times 18.0$	B32522C0155+***	4680	5200	4000
		2.2	$5.0 \times 10.5 \times 18.0$	B32522C0225+***	4680	5200	4000
		3.3	$6.0 \times 11.0 \times 18.0$	B32522C0335+***	3840	4400	4000
		4.7	$7.0 \times 12.5 \times 18.0$	B32522C0475+***	3320	3600	4000
		6.8	$8.5 \times 14.5 \times 18.0$	B32522C0685+***	2720	2800	2000
		10	$9.0 \times 17.5 \times 18.0$	B32522C0106+***	2560	2800	2000
100	63	0.33	$5.0 \times 10.5 \times 18.0$	B32522C1334+***	4680	5200	4000
		0.47	$5.0 \times 10.5 \times 18.0$	B32522C1474+***	4680	5200	4000
		0.68	$5.0 \times 10.5 \times 18.0$	B32522C1684+***	4680	5200	4000
		1.0	$5.0 \times 10.5 \times 18.0$	B32522C1105+***	4680	5200	4000
		1.0 ▽	$6.0 \times 11.0 \times 18.0$	B32522Q1105+***	3840	4400	4000
		1.5	$6.0 \times 11.0 \times 18.0$	B32522C1155+***	3840	4400	4000
		1.5 ▽	$7.0 \times 12.5 \times 18.0$	B32522Q1155+***	3320	3600	4000
		2.2	$7.0 \times 12.5 \times 18.0$	B32522C1225+***	3320	3600	4000
		2.2 ▽	$8.5 \times 14.5 \times 18.0$	B32522Q1225+***	2720	2800	2000
		3.3	$8.5 \times 14.5 \times 18.0$	B32522C1335+***	2720	2800	2000
		3.3 ▽	$9.0 \times 17.5 \times 18.0$	B32522Q1335+***	2560	2800	2000
		4.7	$9.0 \times 17.5 \times 18.0$	B32522C1475+***	2560	2800	2000
		4.7 ▽	$11.0 \times 18.5 \times 18.0$	B32522Q1475+***	—	2200	1200
		6.8	$11.0 \times 18.5 \times 18.0$	B32522C1685+***	—	—	1200
250	160	0.10	$5.0 \times 10.5 \times 18.0$	B32522C3104+***	4680	5200	4000
		0.15	$5.0 \times 10.5 \times 18.0$	B32522C3154+***	4680	5200	4000
		0.22	$5.0 \times 10.5 \times 18.0$	B32522C3224+***	4680	5200	4000
		0.33	$5.0 \times 10.5 \times 18.0$	B32522C3334+***	4680	5200	4000
		0.39	$5.0 \times 10.5 \times 18.0$	B32522C3394+***	4680	5200	4000
		0.47	$6.0 \times 11.0 \times 18.0$	B32522C3474+***	3840	4400	4000
		0.56	$7.0 \times 12.5 \times 18.0$	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 = $\pm 20\%$

K = $\pm 10\%$

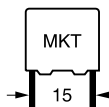
J = $\pm 5\%$

*** = 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} $f \leq 60 \text{ Hz}$	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	μF					
250	160	0.68	$7.0 \times 12.5 \times 18.0$	B32522C3684+***	3320	3600	4000
		1.0	$8.5 \times 14.5 \times 18.0$	B32522C3105+***	2720	2800	2000
		1.0 ▽	$8.5 \times 14.5 \times 18.0$	B32522N3105+***	2720	2800	2000
		1.5	$9.0 \times 17.5 \times 18.0$	B32522C3155+***	2560	2800	2000
		1.5 ▽	$9.0 \times 17.5 \times 18.0$	B32522N3155+***	2560	2800	2000
		2.2	$11.0 \times 18.5 \times 18.0$	B32522C3225+***	—	—	1200
400	200	0.047	$5.0 \times 10.5 \times 18.0$	B32522E6473+***	4680	5200	4000
		0.068	$5.0 \times 10.5 \times 18.0$	B32522E6683+***	4680	5200	4000
		0.10	$5.0 \times 10.5 \times 18.0$	B32522E6104+***	4680	5200	4000
		0.15	$5.0 \times 10.5 \times 18.0$	B32522E6154+***	4680	5200	4000
		0.22	$6.0 \times 11.0 \times 18.0$	B32522E6224+***	3840	4400	4000
		0.33	$7.0 \times 12.5 \times 18.0$	B32522E6334+***	3320	3600	4000
		0.39	$9.0 \times 17.5 \times 18.0$	B32522E6394+***	2560	2800	2000
		0.47	$9.0 \times 17.5 \times 18.0$	B32522E6474+***	2560	2800	2000
		0.56	$9.0 \times 17.5 \times 18.0$	B32522E6564+***	2560	2800	2000
		0.68	$9.0 \times 17.5 \times 18.0$	B32522E6684+***	2560	2800	2000
		1.0	$11.0 \times 18.5 \times 18.0$	B32522E6105+***	—	—	1200
450	200	0.10 ▽	$5.0 \times 10.5 \times 18.0$	B32522N6104+***	4680	5200	4000
		0.15 ▽	$5.0 \times 10.5 \times 18.0$	B32522N6154+***	4680	5200	4000
		0.22 ▽	$6.0 \times 11.0 \times 18.0$	B32522N6224+***	3840	4400	4000
		0.33 ▽	$7.0 \times 12.5 \times 18.0$	B32522N6334+***	3320	3600	4000
		0.47 ▽	$8.5 \times 14.5 \times 18.0$	B32522N6474+***	2720	2800	2000
		0.68 ▽	$9.0 \times 17.5 \times 18.0$	B32522N6684+***	2560	2800	2000
		1.0 ▽	$11.0 \times 18.5 \times 18.0$	B32522N6105+***	—	2200	1200
630	200	0.047	$5.0 \times 10.5 \times 18.0$	B32522D8473+***	—	5200	4000
		0.068	$6.0 \times 11.0 \times 18.0$	B32522D8683+***	—	4400	4000
		0.10	$7.0 \times 12.5 \times 18.0$	B32522D8104+***	—	3600	4000
		0.15	$8.5 \times 14.5 \times 18.0$	B32522D8154+***	—	2800	2000
		0.22	$9.0 \times 17.5 \times 18.0$	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 = $\pm 20\%$

K = $\pm 10\%$

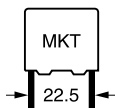
J = $\pm 5\%$

*** = 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} $f \leq 60 \text{ Hz}$	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	μF					
63	40	3.3	$6.0 \times 15.0 \times 26.5$	B32523R0335+***	2720	2800	2880
		4.7	$6.0 \times 15.0 \times 26.5$	B32523R0475+***	2720	2800	2880
		6.8	$6.0 \times 15.0 \times 26.5$	B32523R0685+***	2720	2800	2880
		10	$7.0 \times 16.0 \times 26.5$	B32523R0106+***	2320	2400	2520
		15	$10.5 \times 16.5 \times 26.5$	B32523R0156+***	1560	1600	2160
		22	$12.0 \times 22.0 \times 26.5$	B32523R0226+***	—	—	1800
100	63	1.5	$6.0 \times 15.0 \times 26.5$	B32523Q1155+***	2720	2800	2880
		2.2	$6.0 \times 15.0 \times 26.5$	B32523Q1225+***	2720	2800	2880
		3.3	$6.0 \times 15.0 \times 26.5$	B32523Q1335+***	2720	2800	2880
		4.7	$7.0 \times 16.0 \times 26.5$	B32523Q1475+***	2320	2400	2520
		6.8	$8.5 \times 16.5 \times 26.5$	B32523Q1685+***	1960	2000	2040
		10	$10.5 \times 18.5 \times 26.5$	B32523Q1106+***	1560	1600	2160
250	160	15	$12.0 \times 22.0 \times 26.5$	B32523Q1156+***	—	—	1800
		0.47	$6.0 \times 15.0 \times 26.5$	B32523Q3474+***	2720	2800	2880
		0.68	$6.0 \times 15.0 \times 26.5$	B32523Q3684+***	2720	2800	2880
		1.0	$6.0 \times 15.0 \times 26.5$	B32523Q3105+***	2720	2800	2880
		1.5	$7.0 \times 16.0 \times 26.5$	B32523Q3155+***	2320	2400	2520
		2.2	$10.5 \times 16.5 \times 26.5$	B32523Q3225+***	1560	1600	2160
400	200	3.3	$11.0 \times 20.5 \times 26.5$	B32523Q3335+***	1480	1400	2040
		0.22	$6.0 \times 15.0 \times 26.5$	B32523Q6224+***	2720	2800	2880
		0.33	$6.0 \times 15.0 \times 26.5$	B32523Q6334+***	2720	2800	2880
		0.47	$7.0 \times 16.0 \times 26.5$	B32523Q6474+***	2320	2400	2520
		0.68	$8.5 \times 16.5 \times 26.5$	B32523Q6684+***	1920	2000	2040
		1.0	$10.5 \times 16.5 \times 26.5$	B32523Q6105+***	1560	1600	2160
630	200	1.5	$11.0 \times 20.5 \times 26.5$	B32523Q6155+***	1480	1400	2040
		0.10	$6.0 \times 15.0 \times 26.5$	B32523Q8104+***	2720	2800	2880
		0.15	$6.0 \times 15.0 \times 26.5$	B32523Q8154+***	2720	2800	2880
		0.22	$7.0 \times 16.0 \times 26.5$	B32523Q8224+***	2320	2400	2520
		0.33	$10.5 \times 16.5 \times 26.5$	B32523Q8334+***	1560	1600	2160
		0.47	$10.5 \times 20.5 \times 26.5$	B32523Q8474+***	1560	1600	2160
		0.68	$12.0 \times 22.0 \times 26.5$	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 = $\pm 20\%$

K = $\pm 10\%$

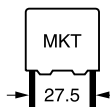
J = $\pm 5\%$

*** = 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} $f \leq 60 \text{ Hz}$	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	μF					
63	40	4.7	$11.0 \times 21.0 \times 31.5$	B32524R0475+***	—	1400	1280
		6.8	$11.0 \times 21.0 \times 31.5$	B32524Q0685+***	—	1400	1280
		10	$11.0 \times 21.0 \times 31.5$	B32524R0106+***	—	1400	1280
		15	$11.0 \times 21.0 \times 31.5$	B32524R0156+***	—	1400	1280
		22	$11.0 \times 21.0 \times 31.5$	B32524R0226+***	—	1400	1280
		33	$12.5 \times 21.5 \times 31.5$	B32524R0336+***	—	1200	1120
		47	$18.0 \times 27.5 \times 31.5$	B32524R0476+***	—	—	800
		68	$18.0 \times 27.5 \times 31.5$	B32524R0686+***	—	—	800
		100	$22.0 \times 36.5 \times 31.5$	B32524R0107+***	—	—	640
100	63	4.7	$11.0 \times 21.0 \times 31.5$	B32524Q1475+***	—	1400	1280
		6.8	$11.0 \times 21.0 \times 31.5$	B32524Q1685+***	—	1400	1280
		10	$11.0 \times 21.0 \times 31.5$	B32524Q1106+***	—	1400	1280
		15	$11.0 \times 21.0 \times 31.5$	B32524Q1156+***	—	1400	1280
		22	$14.0 \times 24.5 \times 31.5$	B32524Q1226+***	—	1000	1040
		33	$18.0 \times 27.5 \times 31.5$	B32524Q1336+***	—	—	800
		47	$21.0 \times 31.0 \times 31.5$	B32524Q1476+***	—	—	720
		68	$22.0 \times 36.5 \times 31.5$	B32524Q1686+***	—	—	640
250	160	1.5	$11.0 \times 21.0 \times 31.5$	B32524Q3155+***	—	1400	1280
		2.2	$11.0 \times 21.0 \times 31.5$	B32524Q3225+***	—	1400	1280
		3.3	$11.0 \times 21.0 \times 31.5$	B32524Q3335+***	—	1400	1280
		4.7	$11.0 \times 21.0 \times 31.5$	B32524Q3475+***	—	1400	1280
		6.8	$11.0 \times 21.0 \times 31.5$	B32524R3685+***	—	1400	1280
		10	$12.5 \times 21.5 \times 31.5$	B32524R3106+***	—	1200	1120
		15	$15.0 \times 24.5 \times 31.5$	B32524R3156M***	—	—	960
		15	$18.0 \times 27.5 \times 31.5$	B32524R3156J***	—	—	960
		15	$18.0 \times 27.5 \times 31.5$	B32524R3156K***	—	—	960
		22	$19.0 \times 30.0 \times 31.5$	B32524R3226+***	—	—	720
		33	$22.0 \times 36.5 \times 31.5$	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 = $\pm 20\%$

K = $\pm 10\%$

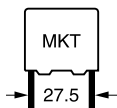
J = $\pm 5\%$

*** = 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} $f \leq 60 \text{ Hz}$	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	μF					
400	200	0.68	$11.0 \times 19.0 \times 31.5$	B32524Q6684+***	—	1400	1280
		1.0	$11.0 \times 19.0 \times 31.5$	B32524Q6105+***	—	1400	1280
		1.5	$11.0 \times 19.0 \times 31.5$	B32524Q6155+***	—	1400	1280
		2.2	$11.0 \times 21.0 \times 31.5$	B32524R6225+***	—	1400	1280
		3.3	$14.0 \times 24.5 \times 31.5$	B32524R6335+***	—	1000	1040
		4.7	$14.0 \times 24.5 \times 31.5$	B32524R6475+***	—	1000	1040
		6.8	$18.0 \times 27.5 \times 31.5$	B32524R6685+***	—	—	800
		10	$22.0 \times 36.5 \times 31.5$	B32524R6106+***	—	—	640
630	220	0.33	$11.0 \times 21.0 \times 31.5$	B32524Q8334+***	—	1400	1280
		0.47	$11.0 \times 21.0 \times 31.5$	B32524Q8474+***	—	1400	1280
		0.68	$11.0 \times 21.0 \times 31.5$	B32524Q8684+***	—	1400	1280
		1.0	$14.0 \times 24.5 \times 31.5$	B32524Q8105+***	—	1000	1040
		1.5	$18.0 \times 27.5 \times 31.5$	B32524Q8155+***	—	—	800
		2.2	$21.0 \times 31.0 \times 31.5$	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 = $\pm 20\%$

K = $\pm 10\%$

J = $\pm 5\%$

*** = Packaging code:

289 = Ammo pack

189 = Reel

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

B32526
General purpose (wound)

MKT

37.5

Ordering codes and packing units (lead spacing 37.5 mm)

V_R	V_{RMS} $f \leq 60 \text{ Hz}$	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	μF					
63	40	22	$12.0 \times 22.0 \times 41.5$	B32526R0226+***	—	—	1620
		33	$12.0 \times 22.0 \times 41.5$	B32526R0336+***	—	—	1620
		47	$12.0 \times 22.0 \times 41.5$	B32526R0476+***	—	—	1620
		56	$24.0 \times 15.0 \times 41.5$	B32526T0566+***	—	—	1040
		68	$16.0 \times 28.5 \times 41.5$	B32526R0686+***	—	—	800
		82	$24.0 \times 19.0 \times 41.5$	B32526T0826+***	—	—	780
		100	$18.0 \times 32.5 \times 41.5$	B32526R0107+***	—	—	720
		150	$20.0 \times 39.5 \times 41.5$	B32526R0157+***	—	—	640
		220	$28.0 \times 42.5 \times 41.5$	B32526R0227A***	—	—	440
100	63	15	$12.0 \times 22.0 \times 41.5$	B32526R1156+***	—	—	1620
		22	$12.0 \times 22.0 \times 41.5$	B32526R1226+***	—	—	1620
		33	$14.0 \times 25.0 \times 41.5$	B32526R1336+***	—	—	1380
		33	$24.0 \times 15.0 \times 41.5$	B32526T1336+***	—	—	1040
		47	$16.0 \times 28.5 \times 41.5$	B32526R1476+***	—	—	800
		47	$24.0 \times 19.0 \times 41.5$	B32526T1476+***	—	—	780
		68	$18.0 \times 32.5 \times 41.5$	B32526R1686+***	—	—	720
		100	$20.0 \times 39.5 \times 41.5$	B32526R1107+***	—	—	640
		150	$28.0 \times 42.5 \times 41.5$	B32526R1157+***	—	—	440
250	160	4.7	$12.0 \times 22.0 \times 41.5$	B32526R3475+***	—	—	1620
		6.8	$12.0 \times 22.0 \times 41.5$	B32526R3685+***	—	—	1620
		10	$12.0 \times 22.0 \times 41.5$	B32526R3106+***	—	—	1620
		15	$14.0 \times 25.0 \times 41.5$	B32526R3156+***	—	—	1380
		15	$24.0 \times 15.0 \times 41.5$	B32526T3156+***	—	—	1040
		22	$16.0 \times 28.5 \times 41.5$	B32526R3226+***	—	—	800
		22	$24.0 \times 19.0 \times 41.5$	B32526T3226+***	—	—	780
		33	$20.0 \times 39.5 \times 41.5$	B32526R3336+***	—	—	640
		47	$20.0 \times 39.5 \times 41.5$	B32526R3476+***	—	—	640
		68	$28.0 \times 42.5 \times 41.5$	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 = $\pm 20\%$

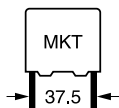
K = $\pm 10\%$

J = $\pm 5\%$

A = $-15 \dots +5\%$ (220 μF 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} $f \leq 60 \text{ Hz}$	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	μF					
400	200	3.3	$12.0 \times 22.0 \times 41.5$	B32526R6335+***	—	—	1620
		4.7	$12.0 \times 22.0 \times 41.5$	B32526R6475+***	—	—	1620
		5.6	$24.0 \times 15.0 \times 41.5$	B32526T6565+***	—	—	1040
		6.8	$14.0 \times 25.0 \times 41.5$	B32526R6685+***	—	—	1380
		8.2	$24.0 \times 19.0 \times 41.5$	B32526T6825+***	—	—	780
		10	$18.0 \times 32.5 \times 41.5$	B32526R6106+***	—	—	720
		15	$20.0 \times 39.5 \times 41.5$	B32526R6156+***	—	—	640
		22	$28.0 \times 42.5 \times 41.5$	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 = $\pm 20\%$

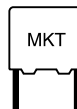
K = $\pm 10\%$

J = $\pm 5\%$

A = $-15 \dots +5\%$ (220 μF type only)

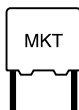
*** = Packaging code:

000 = Untaped (standard 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 $\tan \delta$ (in 10^{-3}) at 20 °C (upper limit values)	at	$C_R \leq 0.1 \mu F$	$0.1 \mu F < C_R \leq 1 \mu F$	$C_R > 1 \mu F$
	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	$C_R \leq 0.33 \mu F$		$C_R > 0.33 \mu F$
	≤ 100 V DC	3750 M Ω		1250 s
	≥ 250 V DC	7500 M Ω		2500 s
DC test voltage	1.4 · V_R , 2 s			
Category voltage V_C (continuous operation with V_{DC} or V_{AC} at $f \leq 60$ Hz)	T_A (°C)	DC voltage derating	AC voltage derating	
	$T_A \leq 85$	$V_C = V_R$	$V_{C,RMS} = V_{RMS}$	
	$85 < T_A \leq 125$	$V_C = V_R \cdot (165 - T_A)/80$	$V_{C,RMS} = V_{RMS} \cdot (165 - T_A)/80$	
Operating voltage V_{op} for short operating periods (V_{DC} or V_{AC} at $f \leq 60$ Hz)	T_A (°C)	DC voltage (max. hours)	AC voltage (max. hours)	
	$T_A \leq 100$	$V_{op} = 1.25 \cdot V_C$ (2000 h)	$V_{op} = 1.0 \cdot V_{C,RMS}$ (2000 h)	
	$100 < T_A \leq 125$	$V_{op} = 1.25 \cdot V_C$ (1000 h)	$V_{op} = 1.0 \cdot V_{C,RMS}$ (1000 h)	
Damp heat test Limit values after damp heat test	56 days/40 °C/93% relative humidity 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} $\geq 50\%$ of minimum or time constant $\tau = C_R \cdot R_{ins}$ as-delivered values			
Reliability: Failure rate λ Service life t_{SL}	1 fit ($\leq 1 \cdot 10^{-9}/h$) at 0.5 · V_R , 40 °C 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 Failure due to variation of parameters	Short circuit or open circuit Capacitance change $ \Delta C/C $ $> 10\%$ Dissipation factor $\tan \delta$ $> 2 \cdot$ upper limit value Insulation resistance R_{ins} < 150 M Ω ($C_R \leq 0.33 \mu F$) or time constant $\tau = C_R \cdot R_{ins}$ < 50 s ($C_R > 0.33 \mu F$)			



B32520 ... B32529

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/ μ s.

"k₀" represents the maximum permissible pulse characteristic of the waveform applied to the capacitor, expressed in V²/ μ s.

Note:

The values of dV/dt and k₀ provided below must not be exceeded in order to avoid damaging the capacitor.

dV/dt values

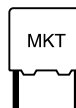
Lead spacing		5 mm	7.5 mm	10 mm		15 mm		22.5 mm	27.5 mm	37.5 mm
Technology		S	S	S	W	S	W	W	W	W
V _R	V _{RMS}	dV/dt in V/μs								
V DC	V AC									
50	32	200	—	—	—	—	—	—	—	—
63	40	250	120	50	—	30	—	3	1	0.8
100	63	300	150	75	—	50	5	4	3	1
250	160	400	200	150	—	100	10	8	5	4
400	200	600	275	175	—	125	—	10	8.5	6
450	200	—	—	—	—	—	20	—	—	—
630	400	800	—	320	—	150	—	15	12	—

S = Stacked, W = Wound

k₀ values

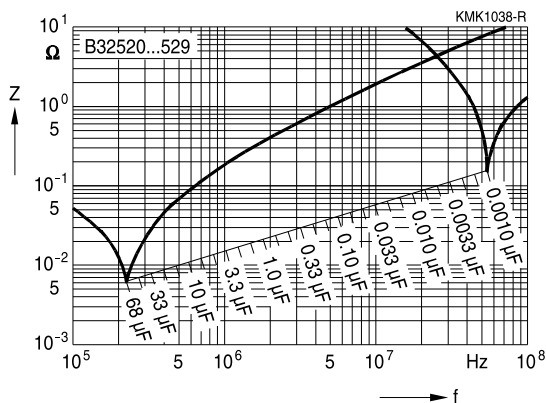
Lead spacing		5 mm	7.5 mm	10 mm		15 mm		22.5 mm	27.5 mm	37.5 mm
Technology		S	S	S	W	S	W	W	W	W
V _R	V _{RMS}	k ₀ in V ² /μs								
V DC	V AC									
50	32	20000	—	—	—	—	—	—	—	—
63	40	30000	15000	6300	—	3800	—	375	130	100
100	63	60000	30000	15000	—	10000	850	800	600	200
250	160	200000	100000	75000	—	50000	5000	4000	2500	2000
400	200	500000	220000	140000	—	100000	—	10000	8500	6000
450	200	—	—	—	—	—	15000	—	—	—
630	400	1000000	—	400000	—	190000	—	18000	15000	—

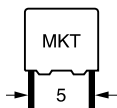
S = Stacked, W = Wound



Impedance Z versus frequency f

(typical values)





B32529

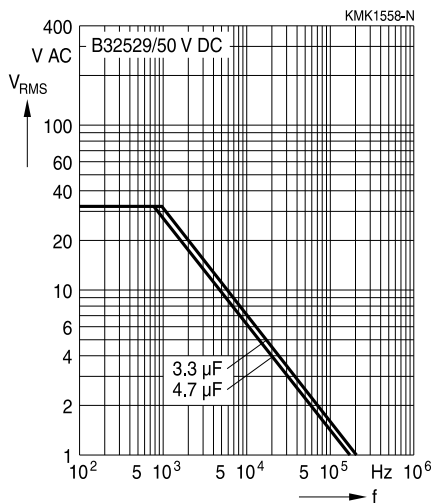
General purpose (stacked)

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

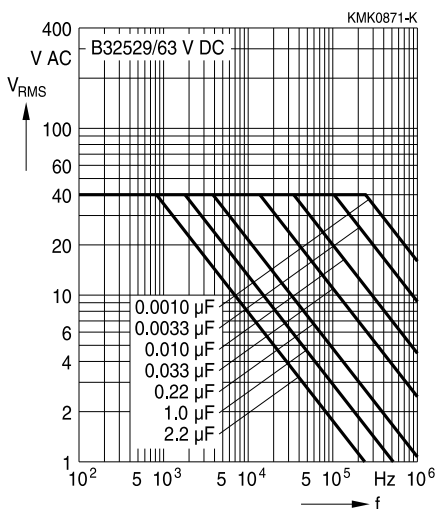
For $T_A > 55^\circ\text{C}$, please refer to "General technical information", section 3.2.3.

Lead spacing 5 mm

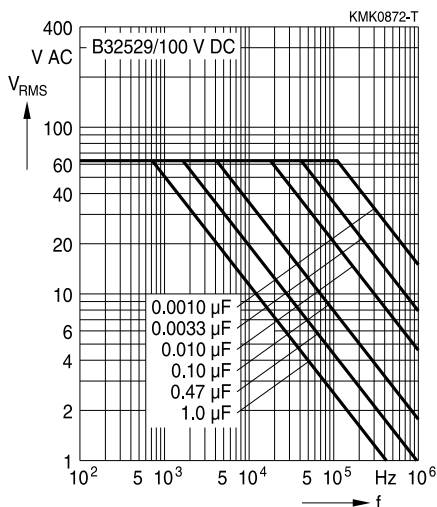
50 V DC/32 V AC



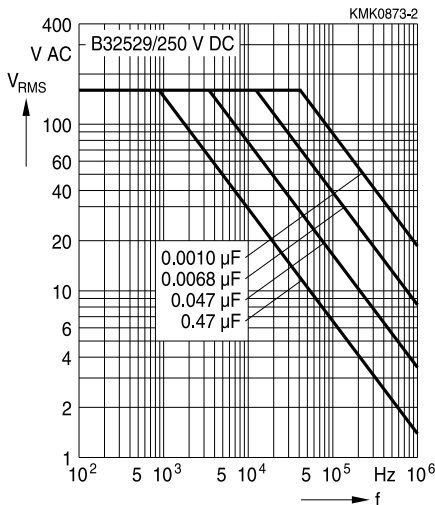
63 V DC/40 V AC



100 V DC/63 V AC

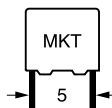


250 V DC/160 V AC



B32529

General purpose (stacked)

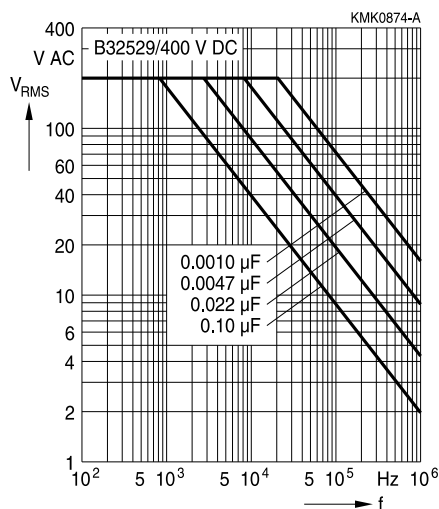


Permissible AC voltage V_{RMS} versus frequency f (for sinusoidal waveforms, $T_A \leq 55^\circ\text{C}$)

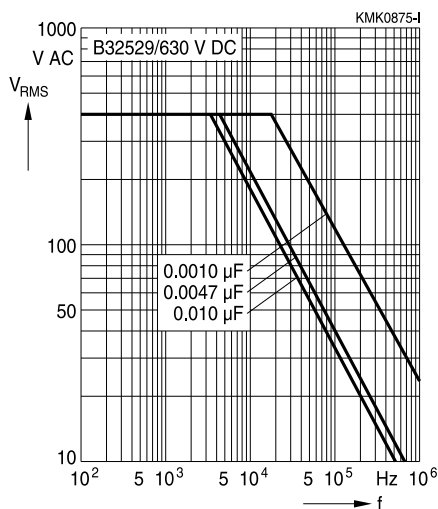
For $T_A > 55^\circ\text{C}$, please refer to "General technical information", section 3.2.3.

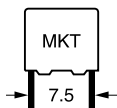
Lead spacing 5 mm

400 V DC/200 V AC



630 V DC/400 V AC





B32520

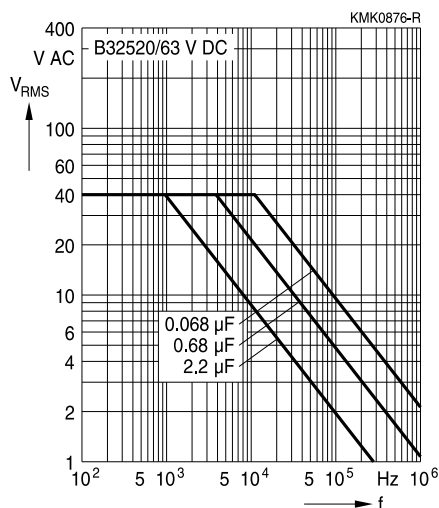
General purpose (stacked)

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

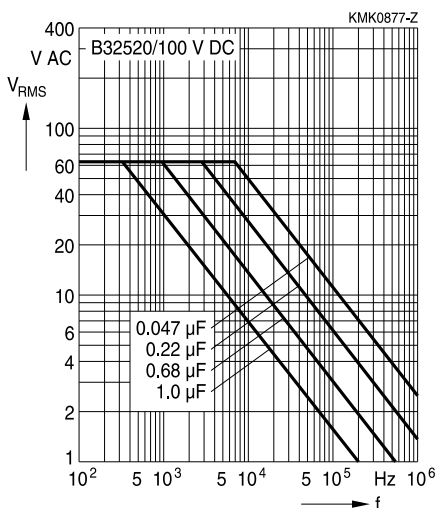
For $T_A > 55^\circ\text{C}$, please refer to "General technical information", section 3.2.3.

Lead spacing 7.5 mm

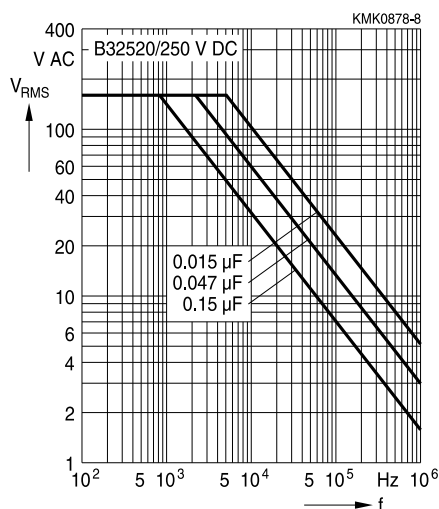
63 V DC/40 V AC



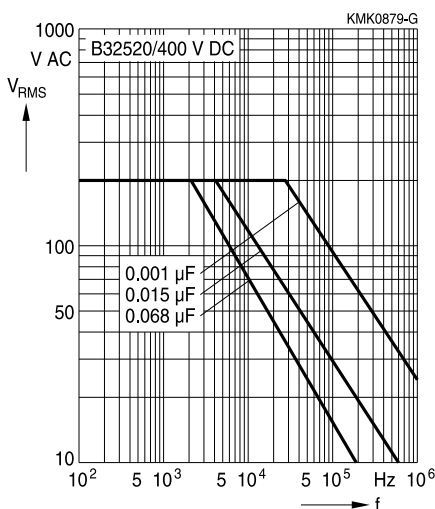
100 V DC/63 V AC



250 V DC/160 V AC

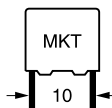


400 V DC/200 V AC



B32521

General purpose (stacked/wound)

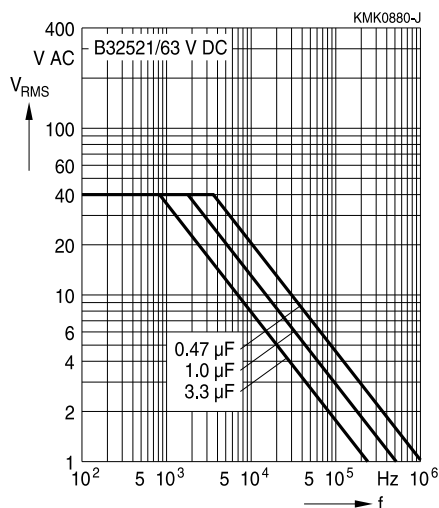


Permissible AC voltage V_{RMS} versus frequency f (for sinusoidal waveforms, $T_A \leq 55^\circ C$)

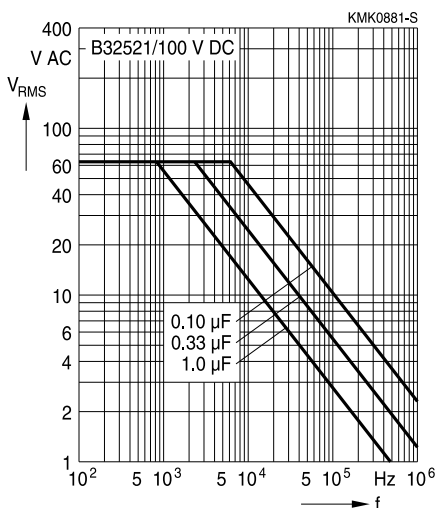
For $T_A > 55^\circ C$, please refer to "General technical information", section 3.2.3.

Lead spacing 10 mm

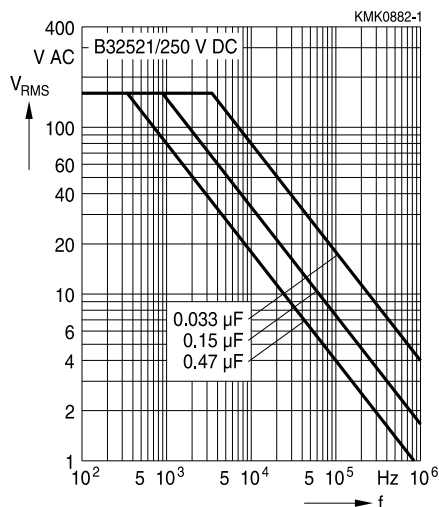
63 V DC/40 V AC



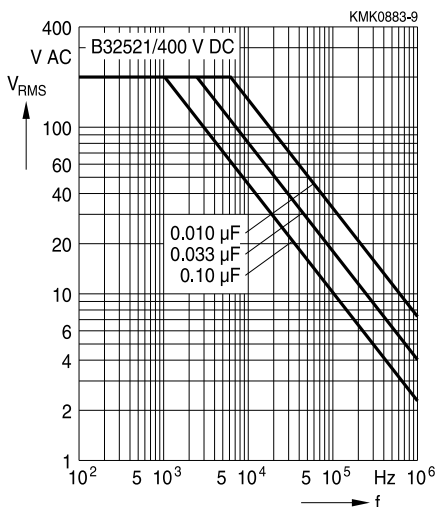
100 V DC/63 V AC

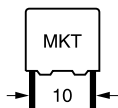


250 V DC/160 V AC



400 V DC/200 V AC





B32521

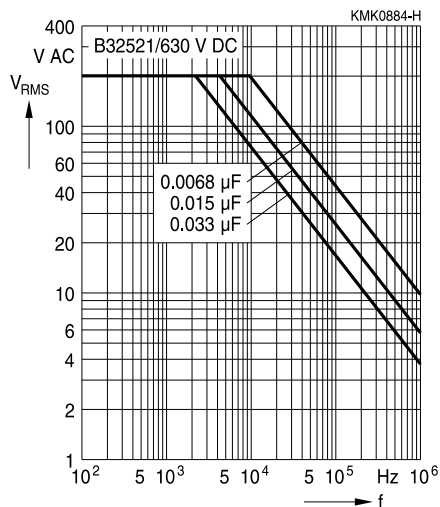
General purpose (stacked/wound)

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)

MKT

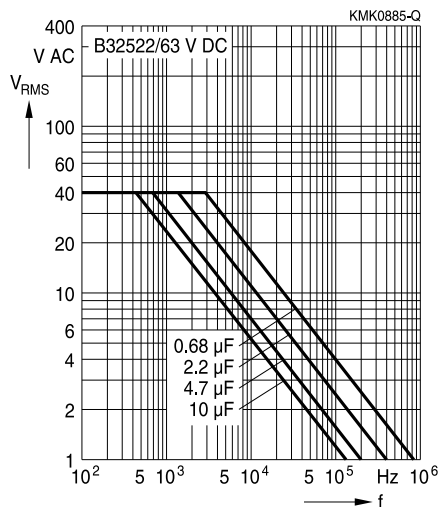
15

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

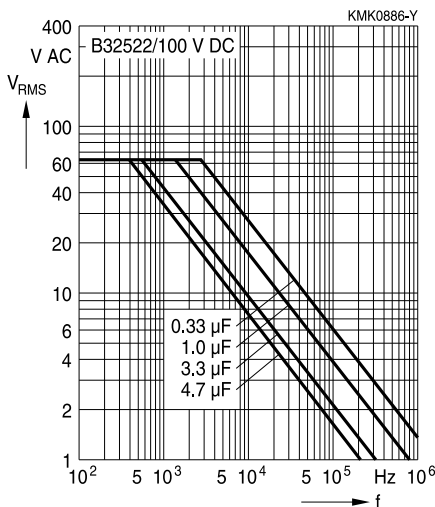
For $T_A > 55^\circ\text{C}$, please refer to "General technical information", section 3.2.3.

Lead spacing 15 mm

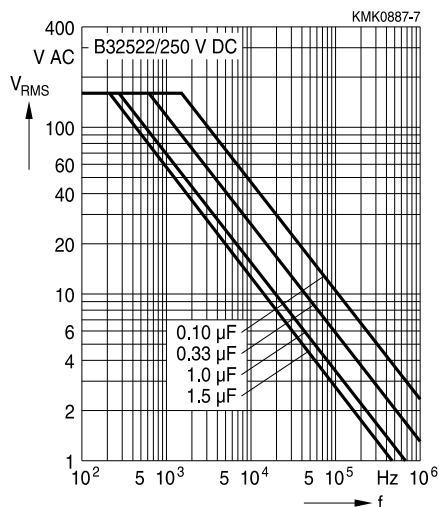
63 V DC/40 V AC



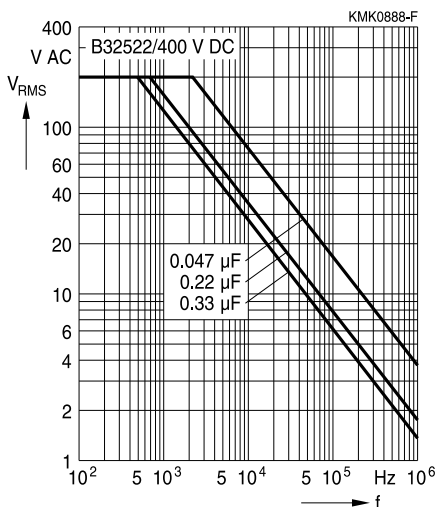
100 V DC/63 V AC

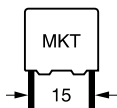


250 V DC/160 V AC



400 V DC/200 V AC





B32522

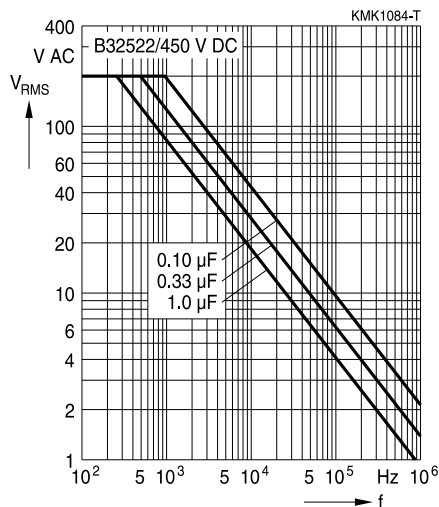
General purpose (stacked/wound)

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

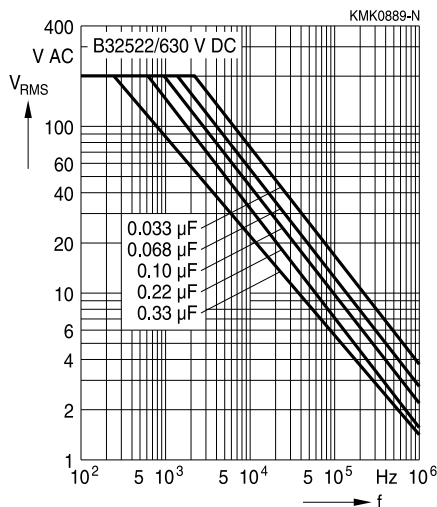
For $T_A > 55^\circ\text{C}$, please refer to "General technical information", section 3.2.3.

Lead spacing 15 mm

450 V DC/200 V AC



630 V DC/200 V AC



B32523

General purpose (wound)

MKT

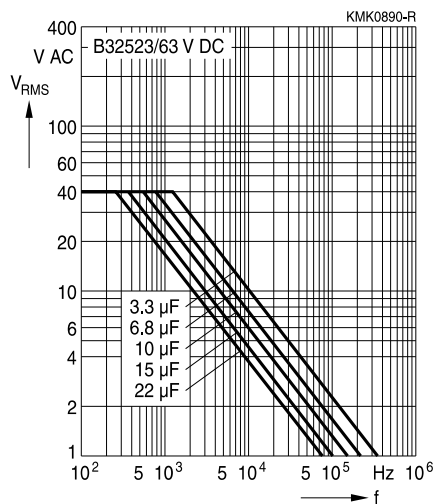
22.5

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

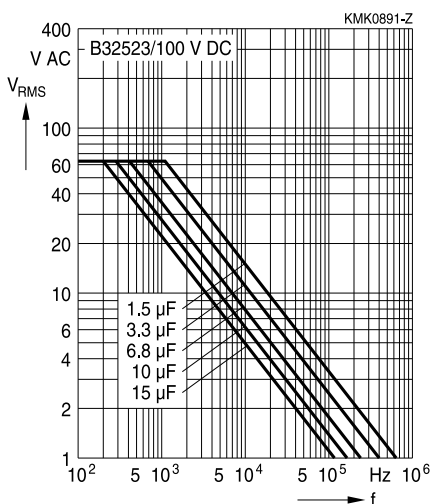
For $T_A > 55^\circ C$, please refer to "General technical information", section 3.2.3.

Lead spacing 22.5 mm

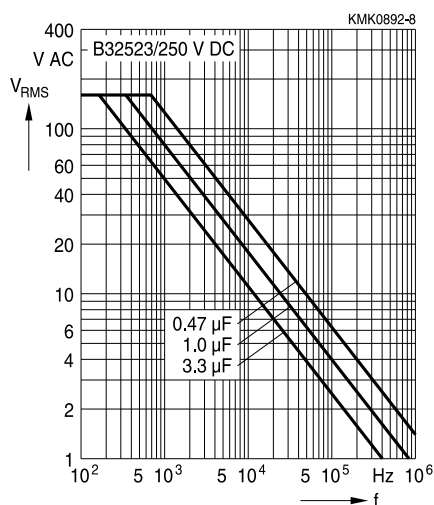
63 V DC/40 V AC



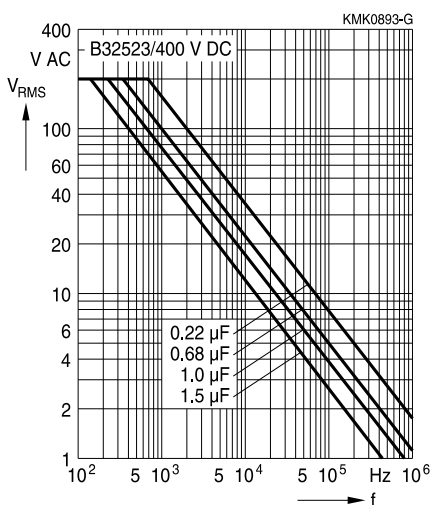
100 V DC/63 V AC

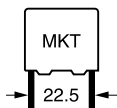


250 V DC/160 V AC



400 V DC/200 V AC





B32523

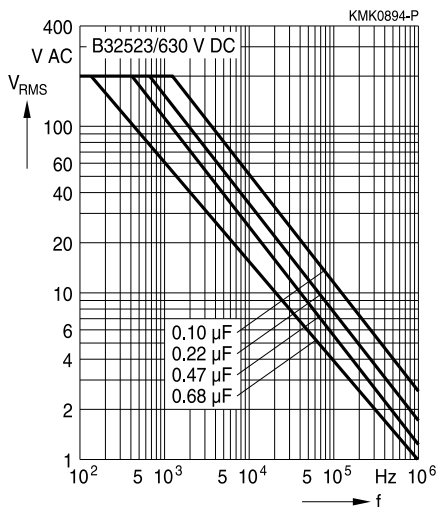
General purpose (wound)

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

For $T_A > 55^\circ\text{C}$, 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)

MKT

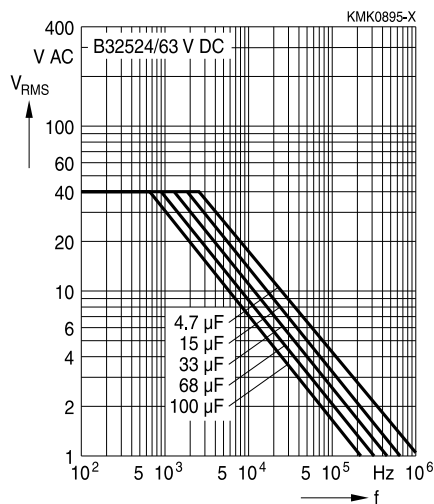
27.5

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

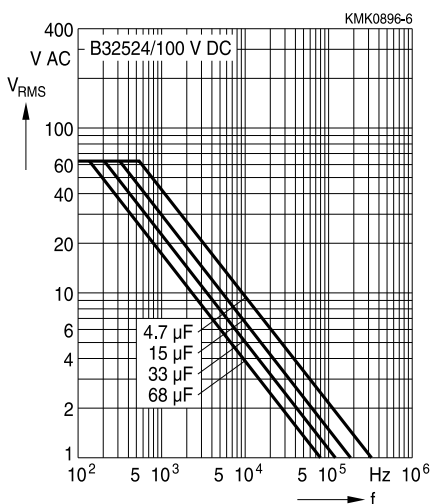
For $T_A > 55^\circ\text{C}$, please refer to "General technical information", section 3.2.3.

Lead spacing 27.5 mm

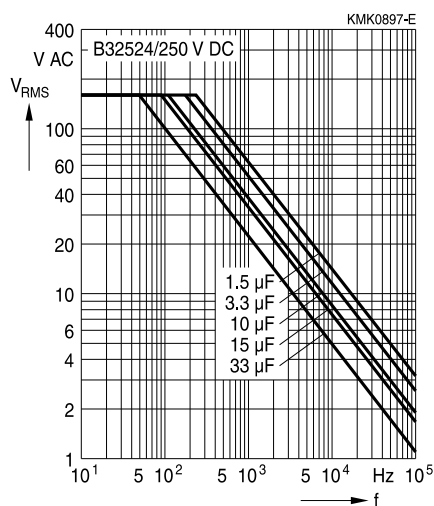
63 V DC/40 V AC



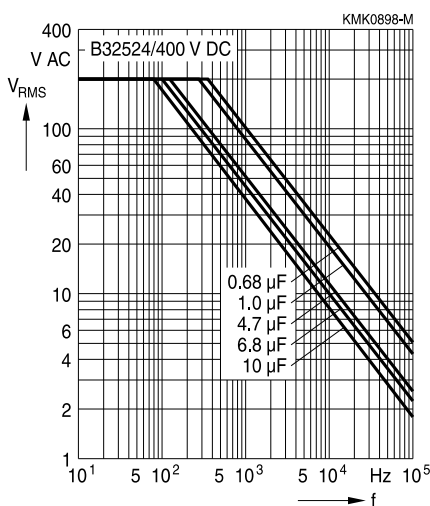
100 V DC/63 V AC

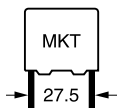


250 V DC/160 V AC



400 V DC/200 V AC





B32524

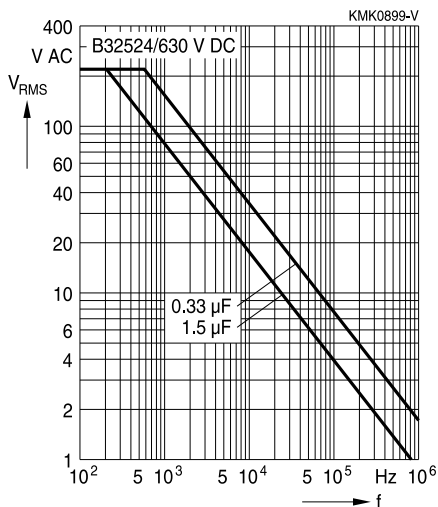
General purpose (wound)

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)

MKT

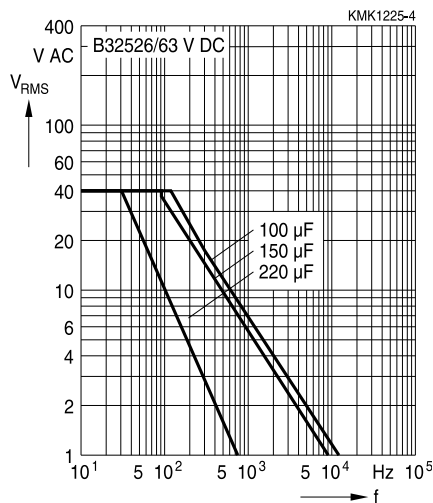
37.5

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

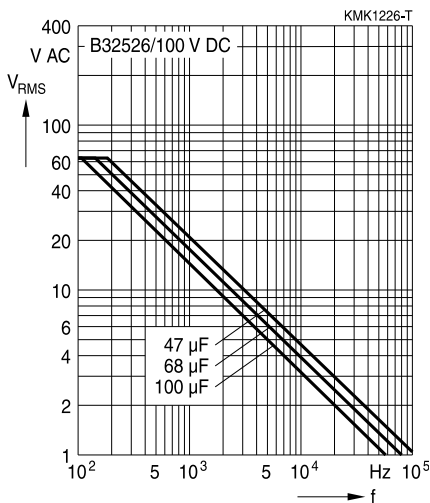
For $T_A > 55^\circ\text{C}$, please refer to "General technical information", section 3.2.3.

Lead spacing 37.5 mm

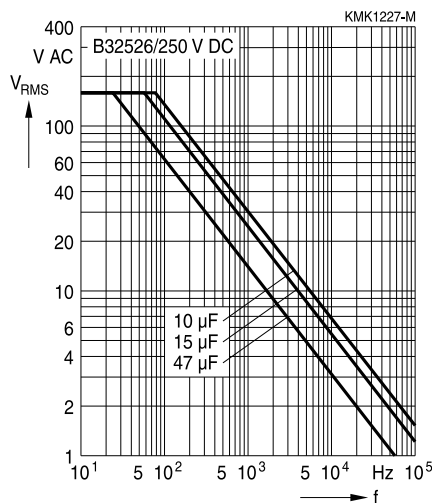
63 V DC/40 V AC



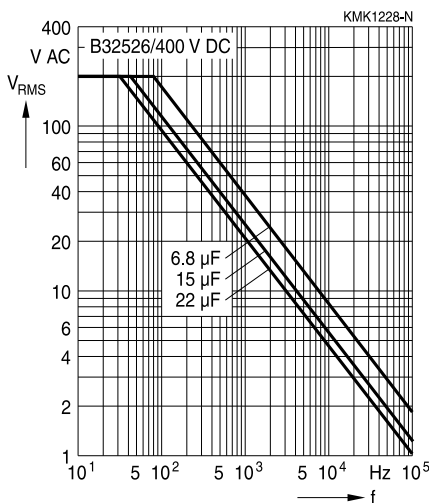
100 V DC/63 V AC

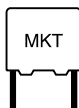


250 V DC/160 V AC



400 V DC/200 V AC





B32520 ... B32529

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, 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.

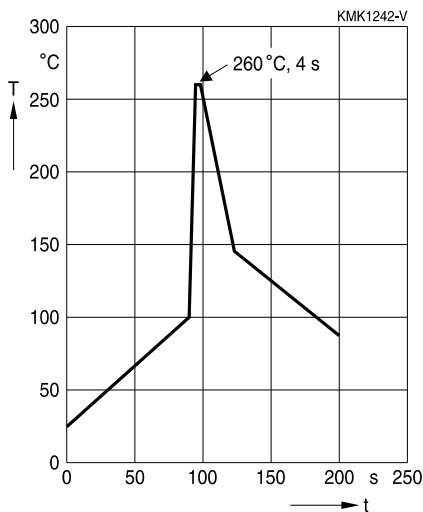
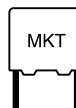
Solder bath temperature	235 ±5 °C
Soldering time	2.0 ±0.5 s
Immersion depth	2.0 +0/−0.5 mm from capacitor body or seating plane
Evaluation criteria:	
Visual inspection	Wetting of wire surface by new solder ≥90%, free-flowing solder

1.2 Resistance to soldering heat

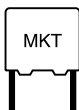
Resistance to soldering heat is tested to IEC 60068-2-20, test Tb, method 1A.

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 (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



B32520 ... B32529

General purpose (stacked/wound)

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.

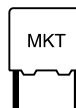
EPCOS recommends the following conditions:

- 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

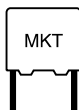


Cautions and warnings

- 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"



B32520 ... B32529

General purpose (stacked/wound)

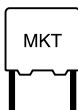
Topic	Safety information	Reference chapter "Mounting guidelines"
Soldering	Do not exceed the specified time or temperature limits during soldering.	1 "Soldering"
Cleaning	Use only suitable solvents for cleaning capacitors.	2 "Cleaning"
Embedding of capacitors in finished assemblies	When embedding finished 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"

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.

Symbols and terms

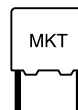
Symbol	English	German
α	Heat transfer coefficient	Wärmeübergangszahl
α_C	Temperature coefficient of capacitance	Temperaturkoeffizient der Kapazität
A	Capacitor surface area	Kondensatoroberfläche
β_C	Humidity coefficient of capacitance	Feuchtekoeffizient der Kapazität
C	Capacitance	Kapazität
C_R	Rated 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)



B32520 ... B32529

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	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 (Feuchtestest)
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 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	Betriebstemperatur
T_R	Rated temperature	Nenntemperatur
T_{ref}	Reference temperature	Referenztemperatur
t_{SL}	Reference service life	Referenz-Lebensdauer



Symbol	English	German
V_{AC}	AC voltage	Wechselspannung
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
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)**.

Important notes

7. The trade names EPCOS, Alu-X, CeraDiode, CeraLink, CeraPad, CeraPlas, CSMP, CSSP, CTVS, DeltaCap, DigiSiMic, DSSP, ExoCore, FilterCap, FormFit, LeaXield, MiniBlue, MiniCell, MKD, MKK, MotorCap, PCC, PhaseCap, PhaseCube, PhaseMod, PhiCap, PQSine, SIFERRIT, SIFI, SIKOREL, SilverCap, SIMDAD, SiMic, SIMID, SineFormer, SIOV, SIP5D, SIP5K, TFAP, 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.

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

EPCOS:

B32529C102K189	B32529C103K189	B32529C1102K189	B32529C1103K189	B32529C1472K189
B32529C155K189	B32529C1683K189	B32529C223K189	B32529D1105K189	B32529D225K189
B32529C1684K289	B32529C3152K289	B32529C3334K289	B32529C3474K289	B32529C6223K289
B32529C6333K289	B32529C6473K289	B32529C8152K289	B32529C8103K289	B32520C0474K289
B32520C0105K289	B32520C0225K289	B32520C1334K289	B32520C3683K289	B32520C3224K289
B32521C6153K289	B32521C6333K289	B32522C1335K289	B32522C3474K289	B32522Q8473K289
B32523Q8104K289	B32523Q8474K289	B32529C3683K189	B32529C6332K189	B32529C6223K189
B32529C6473K189	B32529C8152K189	B32529C8682K189	B32520C0474K189	B32520C0105K189
B32521C0335K189	B32521C3154K189	B32522Q1225K189	B32522C1475K189	B32522C6683K189
B32522N6334K189	B32522N6105K189	B32523Q1106K189	B32523Q3335K189	B32523Q6684K189
B32524Q1156K189	B32524Q8334K189	B32520C0474K000	B32520C0684K000	B32520C0105K000
B32520C0155K000	B32520C0225K000	B32520C1154K000	B32520C1224K000	B32520C1105K000
B32522Q1335K000	B32529C1684J289	B32529C3222J289	B32529C3683J289	B32529D3224J289
B32529C3334J289	B32529C3474J289	B32529C6152J289	B32529C6223J289	B32529C6333J289
B32529C6473J289	B32529D6104J289	B32529C8102J289	B32529C8332J289	B32529C8682J289
B32520C0474J289	B32520C0684J289	B32520C0105J289	B32520C3104J289	B32521C1224J289
B32521C1105J289	B32521C6223J289	B32521C6333J289	B32522C1335J289	B32522C3684J289
B32522N6684J289	B32522Q8683J289	B32529C3473J189	B32529D3224J189	B32529D6104J189
B32520C6683J189	B32521C1224J189	B32521C1474J189	B32521C3683J189	B32521C6153J189
B32521C6473J189	B32521C6104J189	B32521N8223J189	B32522C3224J189	B32522C3155J189