



## Film Capacitors

### Metallized Polyester Film Capacitors (MKT)

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

**Date:** August 2004

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### 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 D or C in digit 7 of ordering code
- Wound capacitor technology for lead spacing 10 to 27.5 mm  
= code N, Q or T in digit 7 of ordering code
- Plastic case (UL 94 V-0)
- Epoxy resin sealing (UL 94 V-0)

### Features

- High pulse strength
- High contact reliability

### Terminals

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

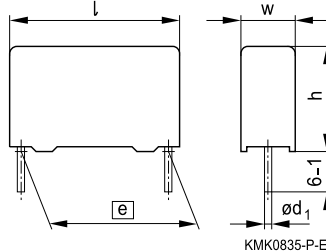
### Marking

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".

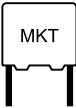
### Dimensional drawing



Dimensions in mm

Lead spacing $\boxed{e}$ ±0.4	Lead diameter $d_1$	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

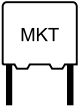
1) 0.5 mm for capacitor width  $w = 4$  mm



Overview of available types

Lead spacing	5.0 mm						7.5 mm				10.0 mm				
Type	B32529						B32520				B32521				
Page	5						9				11				
Technology	s	s	s	s	s	s	s	s	s	s	s	s	s	s	w
V <sub>R</sub> (VDC)	50	63	100	250	400	630	63	100	250	400	63	100	250	400	630
V <sub>rms</sub> (VAC)	32	40	63	160	200	400	40	63	160	200	40	63	160	200	200
C <sub>R</sub> (μF)															
0.0010															
0.0015															
0.0022															
0.0033															
0.0047															
0.0068															
0.010															
0.015															
0.022															
0.033															
0.047															
0.068															
0.10															
0.15															
0.22															
0.33															
0.47															
0.68															
1.0															
1.5															
2.2															
3.3															

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



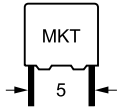
B32520 ... B32529

General purpose (stacked/wound)

Overview of available types

Lead spacing	15.0 mm						22.5 mm						27.5 mm					
Type	B32522						B32523						B32524					
Page	13						15						16					
Technology	s	s/w	s/w	s	w	w	w	w	w	w	w	w	w	w	w	w	w	
$V_R$ (VDC)	63	100	250	400	450	630	63	100	250	400	630	63	100	250	400	630		
$V_{rms}$ (VAC)	40	63	160	200	200	200	40	63	160	200	200	40	63	160	200	220		
$C_R$ ( $\mu$ F)					NEW							NEW						
0.033																		
0.047																		
0.068																		
0.10																		
0.15																		
0.22																		
0.33																		
0.47																		
0.68																		
1.0																		
1.5																		
2.2																		
3.3																		
4.7																		
6.8																		
10																		
15																		
22																		
33																		
47																		
68																		

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


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

$V_R$	$V_{rms}$ $f \leq 60$ Hz VAC	$C_R$ $\mu F$	Max. dimensions $w \times h \times l$ mm	Ordering code (composition see below)	Ammo pack pcs./unit	Reel pcs./unit	Untaped pcs./unit
50	32	0.33	$3.0 \times 6.5 \times 7.2$	B32529C5334+***	2700	2400	2000
		0.47	$3.5 \times 8.0 \times 7.2$	B32529C5474+***	2300	2000	2000
		0.68	$4.5 \times 9.5 \times 7.3$	B32529C5684+***	1800	1500	1500
		1.0	$4.5 \times 9.5 \times 7.3$	B32529C5105+***	1800	1500	1500
		1.5	$6.0 \times 10.5 \times 7.5$	B32529C5155+***	1300	1100	1000
		2.2	$7.8 \times 13.0 \times 7.8$	B32529D5225+***	1000	800	1000
		3.3	$7.8 \times 13.0 \times 7.8$	B32529D5335+***	1000	800	1000
63	40	0.0010	$2.5 \times 6.5 \times 7.2$	B32529C0102+***	3200	2800	2000
		0.0015	$2.5 \times 6.5 \times 7.2$	B32529C0152+***	3200	2800	2000
		0.0022	$2.5 \times 6.5 \times 7.2$	B32529C0222+***	3200	2800	2000
		0.0033	$2.5 \times 6.5 \times 7.2$	B32529C0332+***	3200	2800	2000
		0.0047	$2.5 \times 6.5 \times 7.2$	B32529C0472+***	3200	2800	2000
		0.0068	$2.5 \times 6.5 \times 7.2$	B32529C0682+***	3200	2800	2000
		0.010	$2.5 \times 6.5 \times 7.2$	B32529C0103+***	3200	2800	2000
		0.015	$2.5 \times 6.5 \times 7.2$	B32529C0153+***	3200	2800	2000
		0.022	$2.5 \times 6.5 \times 7.2$	B32529C0223+***	3200	2800	2000
		0.033	$2.5 \times 6.5 \times 7.2$	B32529C0333+***	3200	2800	2000
		0.047	$2.5 \times 6.5 \times 7.2$	B32529C0473+***	3200	2800	2000
		0.068	$2.5 \times 6.5 \times 7.2$	B32529C0683+***	3200	2800	2000
		0.10	$2.5 \times 6.5 \times 7.2$	B32529C0104+***	3200	2800	2000
		0.15	$2.5 \times 6.5 \times 7.2$	B32529C0154+***	3200	2800	2000
		0.22	$2.5 \times 6.5 \times 7.2$	B32529C0224+***	3200	2800	2000
		0.33	$3.0 \times 6.5 \times 7.2$	B32529C0334+***	2700	2400	2000
		0.47	$3.5 \times 8.0 \times 7.2$	B32529C0474+***	2300	2000	2000
		0.68	$4.5 \times 9.5 \times 7.3$	B32529C0684+***	1800	1500	1500
		1.0	$4.5 \times 9.5 \times 7.3$	B32529C0105+***	1800	1500	1500
		1.5	$6.0 \times 10.5 \times 7.5$	B32529C0155+***	1300	1100	1000
2.2	$7.8 \times 13.0 \times 7.8$	B32529D0225+***	1000	800	1000		

Further E series and intermediate capacitance values on request.

**Composition of ordering code**

+ = Capacitance tolerance code:

M =  $\pm 20\%$

K =  $\pm 10\%$

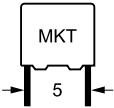
J =  $\pm 5\%$

\*\*\* = Packaging code:

289 = Ammo pack

189 = Reel

000 = Untaped (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./unit	Reel pcs./unit	Untaped pcs./unit
VDC	VAC	$\mu F$					
100	63	0.0010	$2.5 \times 6.5 \times 7.2$	B32529C1102+***	3200	2800	2000
		0.0015	$2.5 \times 6.5 \times 7.2$	B32529C1152+***	3200	2800	2000
		0.0022	$2.5 \times 6.5 \times 7.2$	B32529C1222+***	3200	2800	2000
		0.0033	$2.5 \times 6.5 \times 7.2$	B32529C1332+***	3200	2800	2000
		0.0047	$2.5 \times 6.5 \times 7.2$	B32529C1472+***	3200	2800	2000
		0.0068	$2.5 \times 6.5 \times 7.2$	B32529C1682+***	3200	2800	2000
		0.010	$2.5 \times 6.5 \times 7.2$	B32529C1103+***	3200	2800	2000
		0.015	$2.5 \times 6.5 \times 7.2$	B32529C1153+***	3200	2800	2000
		0.022	$2.5 \times 6.5 \times 7.2$	B32529C1223+***	3200	2800	2000
		0.033	$2.5 \times 6.5 \times 7.2$	B32529C1333+***	3200	2800	2000
		0.047	$2.5 \times 6.5 \times 7.2$	B32529C1473+***	3200	2800	2000
		0.068	$2.5 \times 6.5 \times 7.2$	B32529C1683+***	3200	2800	2000
		0.10	$2.5 \times 6.5 \times 7.2$	B32529C1104+***	3200	2800	2000
		0.15	$3.0 \times 6.5 \times 7.2$	B32529C1154+***	2700	2400	2000
		0.22	$3.5 \times 8.0 \times 7.2$	B32529C1224+***	2300	2000	2000
		0.33	$3.5 \times 8.0 \times 7.2$	B32529C1334+***	2300	2000	2000
		0.47	$4.5 \times 9.5 \times 7.3$	B32529C1474+***	1800	1500	1500
0.68	$6.0 \times 10.5 \times 7.5$	B32529C1684+***	1300	1100	1000		
1.0	$7.8 \times 13.0 \times 7.8$	B32529D1105+***	1000	800	1000		

Further E series and intermediate capacitance values on request.

**Composition of ordering code**

+ = Capacitance tolerance code:

 M =  $\pm 20\%$ 

 K =  $\pm 10\%$ 

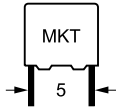
 J =  $\pm 5\%$ 

\*\*\* = Packaging code:

289 = Ammo pack

189 = Reel

000 = Untaped (lead length 6 – 1 mm)


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

$V_R$	$V_{rms}$ $f \leq 60$ Hz VAC	$C_R$ $\mu F$	Max. dimensions $w \times h \times l$ mm	Ordering code (composition see below)	Ammo pack pcs./unit	Reel pcs./unit	Untaped pcs./unit
250	160	0.0010	$2.5 \times 6.5 \times 7.2$	B32529C3102+***	3200	2800	2000
		0.0015	$2.5 \times 6.5 \times 7.2$	B32529C3152+***	3200	2800	2000
		0.0022	$2.5 \times 6.5 \times 7.2$	B32529C3222+***	3200	2800	2000
		0.0033	$2.5 \times 6.5 \times 7.2$	B32529C3332+***	3200	2800	2000
		0.0047	$2.5 \times 6.5 \times 7.2$	B32529C3472+***	3200	2800	2000
		0.0068	$2.5 \times 6.5 \times 7.2$	B32529C3682+***	3200	2800	2000
		0.010	$2.5 \times 6.5 \times 7.2$	B32529C3103+***	3200	2800	2000
		0.015	$2.5 \times 6.5 \times 7.2$	B32529C3153+***	3200	2800	2000
		0.022	$2.5 \times 6.5 \times 7.2$	B32529C3223+***	3200	2800	2000
		0.033	$3.0 \times 6.5 \times 7.2$	B32529C3333+***	2700	2400	2000
		0.047	$3.5 \times 8.0 \times 7.2$	B32529C3473+***	2300	2000	2000
		0.068	$4.5 \times 9.5 \times 7.3$	B32529C3683+***	1800	1500	1500
		0.10	$4.5 \times 9.5 \times 7.3$	B32529C3104+***	1800	1500	1500
		0.15	$5.0 \times 10.0 \times 7.5$	B32529C3154+***	1600	1400	1500
		0.22	$7.8 \times 13.0 \times 7.8$	B32529D3224+***	1000	800	1000
		0.33	$7.8 \times 13.0 \times 7.8$	B32529C3334+***	1000	800	1000
0.47	$7.8 \times 13.0 \times 7.8$	B32529C3474+***	1000	800	1000		
400	200	0.0010	$2.5 \times 6.5 \times 7.2$	B32529C6102+***	3200	2800	2000
		0.0015	$2.5 \times 6.5 \times 7.2$	B32529C6152+***	3200	2800	2000
		0.0022	$2.5 \times 6.5 \times 7.2$	B32529C6222+***	3200	2800	2000
		0.0033	$2.5 \times 6.5 \times 7.2$	B32529C6332+***	3200	2800	2000
		0.0047	$2.5 \times 6.5 \times 7.2$	B32529C6472+***	3200	2800	2000
		0.0068	$2.5 \times 6.5 \times 7.2$	B32529C6682+***	3200	2800	2000
		0.010	$3.0 \times 6.5 \times 7.2$	B32529C6103+***	2700	2400	2000
		0.015	$3.5 \times 8.0 \times 7.2$	B32529C6153+***	2300	2000	2000
		0.022	$4.5 \times 9.5 \times 7.3$	B32529C6223+***	1800	1500	1500
		0.033	$5.0 \times 10.0 \times 7.5$	B32529C6333+***	1600	1400	1500
		0.047	$6.0 \times 10.5 \times 7.5$	B32529C6473+***	1300	1100	1000
		0.068	$7.8 \times 13.0 \times 7.8$	B32529D6683+***	1000	800	1000
		0.10	$7.8 \times 13.0 \times 7.8$	B32529D6104+***	1000	800	1000

Further E series and intermediate capacitance values on request.

**Composition of ordering code**

+ = Capacitance tolerance code:

M =  $\pm 20\%$

K =  $\pm 10\%$

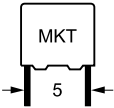
J =  $\pm 5\%$

\*\*\* = Packaging code:

289 = Ammo pack

189 = Reel

000 = Untaped (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./unit	Reel pcs./unit	Untaped pcs./unit
VDC	VAC	$\mu\text{F}$					
630	400	0.0010	$2.5 \times 6.5 \times 7.2$	B32529C8102+***	3200	2800	2000
		0.0015	$2.5 \times 6.5 \times 7.2$	B32529C8152+***	3200	2800	2000
		0.0022	$2.5 \times 6.5 \times 7.2$	B32529C8222+***	3200	2800	2000
		0.0033	$3.5 \times 8.0 \times 7.2$	B32529C8332+***	2300	2000	2000
		0.0047	$3.5 \times 8.0 \times 7.2$	B32529C8472+***	2300	2000	2000
		0.0068	$3.5 \times 8.0 \times 7.2$	B32529C8682+***	2300	2000	2000
		0.010	$5.0 \times 10.0 \times 7.5$	B32529C8103+***	1600	1400	1500

Further E series and intermediate capacitance values on request.

**Composition of ordering code**

+ = Capacitance tolerance code:

M =  $\pm 20\%$

K =  $\pm 10\%$

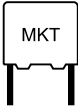
J =  $\pm 5\%$

\*\*\* = Packaging code:

289 = Ammo pack

189 = Reel

000 = Untaped (lead length 6 – 1 mm)


**B32520 ... B32529**
**General purpose (stacked/wound)**
**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)	$V_R$	$C_R \leq 0.33 \mu F$		$C_R > 0.33 \mu F$
	$\leq 100$ VDC	3750 M $\Omega$		1250 s
	$\geq 250$ VDC	7500 M $\Omega$		2500 s
DC test voltage	$1.4 \cdot V_R$ , 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	56 days/40 °C/93% relative humidity			
Limit values after damp heat test	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 $\lambda$	1 fit ( $\leq 1 \cdot 10^{-9}/h$ ) at $0.5 \cdot V_R$ , 40 °C			
Service life $t_{SL}$	200 000 h at $1.0 \cdot V_R$ , 40 °C			
	For conversion to other operating conditions and temperatures, refer to chapter "Quality assurance", page .			
Failure criteria:				
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 $R_{ins}$		$< 150$ M $\Omega$ ( $C_R \leq 0.33 \mu F$ )	
	or time constant $\tau = C_R \cdot R_{ins}$		$< 50$ s ( $C_R > 0.33 \mu F$ )	

**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:*

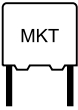
*The values of dV/dt and k<sub>0</sub> provided below must not be exceeded in order to avoid damaging the capacitor.*

**dV/dt values**

Lead spacing		5 mm	7.5 mm	10 mm		15 mm		22.5 mm	27.5 mm
Technology		Stacked	Stacked	Stacked	Wound	Stacked	Wound	Wound	Wound
V <sub>R</sub>	V <sub>rms</sub>	dV/dt in V/ $\mu$ s							
VDC	VAC								
50	32	200	–	–	–	–	–	–	–
63	40	250	120	50	–	30	–	3	1
100	63	300	150	75	–	50	5	4	3
250	160	400	200	150	–	100	10	6	4.5
400	200	600	275	175	–	125	–	10	7.5
450	200	–	–	–	–	–	20	–	–
630	400	800	–	–	20	–	25	15	12

**k<sub>0</sub> values**

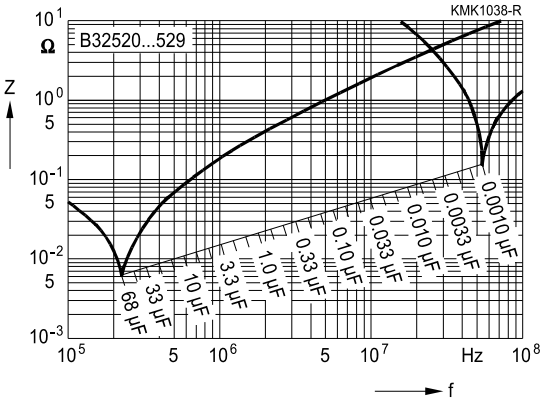
Lead spacing		5 mm	7.5 mm	10 mm		15 mm		22.5 mm	27.5 mm
Technology		Stacked	Stacked	Stacked	Wound	Stacked	Wound	Wound	Wound
V <sub>R</sub>	V <sub>rms</sub>	k <sub>0</sub> in V <sup>2</sup> / $\mu$ s							
VDC	VAC								
50	32	20 000	–	–	–	–	–	–	–
63	40	30 000	15 000	6 300	–	3 800	–	375	130
100	63	60 000	30 000	15 000	–	10 000	850	750	600
250	160	200 000	100 000	75 000	–	50 000	5 000	3 000	2 250
400	200	500 000	220 000	140 000	–	100 000	–	8 000	6 000
450	200	–	–	–	–	–	15 000	–	–
630	400	1 000 000	–	–	25 000	–	30 000	18 000	15 000

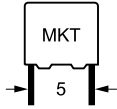


**B32520 ... B32529**

**General purpose (stacked/wound)**

**Impedance Z versus frequency f**  
(typical values)

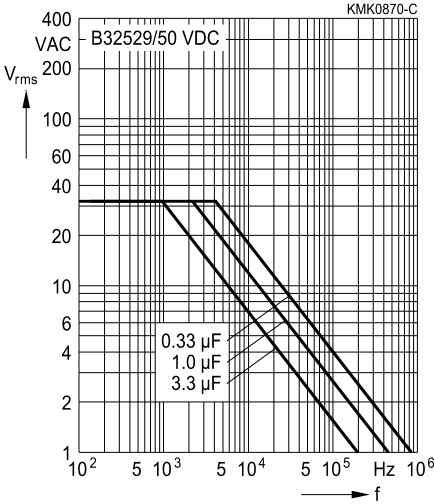




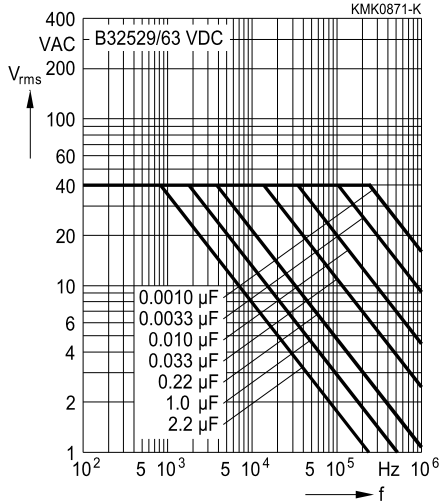
Permissible AC voltage  $V_{rms}$  versus frequency  $f$  (for sinusoidal waveforms,  $T_A \leq 55^\circ C$ )  
 For  $T_A > 55^\circ C$ , please refer to "General technical information", section 3.2.3.

Lead spacing 5 mm

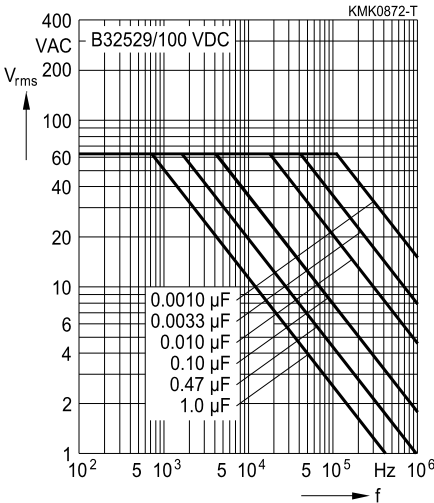
50 VDC/32 VAC



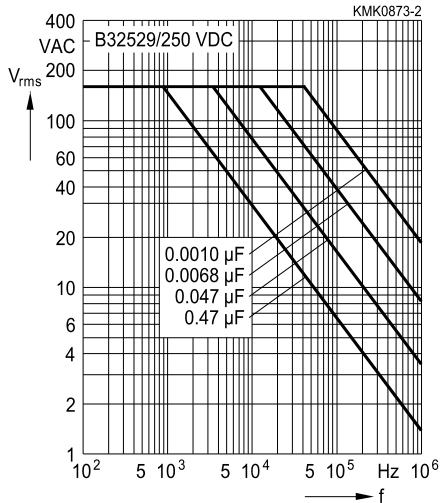
63 VDC/40 VAC

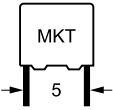


100 VDC/63 VAC



250 VDC/160 VAC





**B32529**

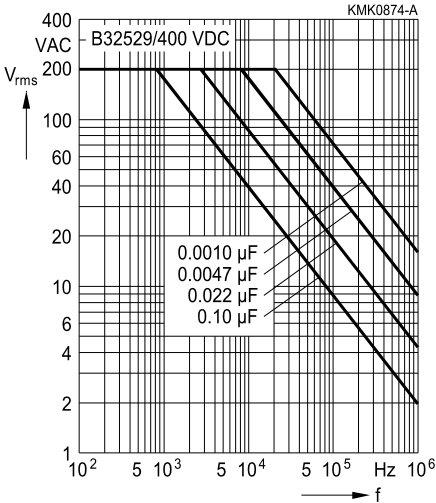
**General purpose (stacked)**

**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 VDC/200 VAC**



**630 VDC/400 VAC**

