

Film Capacitors

Metallized Polypropylene Film Capacitors (MFP)

Series/Type: B32682 ... B32686

Date: July 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.

Very high pulse (wound)

Typical applications

- Smoothing
- Snubbing
- Electronic ballast
- Switch mode power supplies
- High-frequency AC loads
- High voltages and very high currents

Climatic

- Max. operating temperature: 110 °C
- Climatic category (IEC 60068-1): 55/100/56

Construction

- Dielectric: polypropylene (PP)
- Film metallized on one side and metal foils internally connected in series
- Plastic case (UL 94 V-0)
- Epoxy resin sealing (UL 94 V-0)

Features

- Very high pulse strength
- Highest possible contact reliability
- Self-healing properties
- RoHS-compatible

Terminals

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

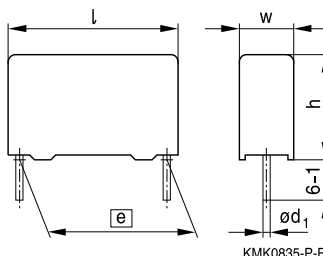
Marking

Manufacturer's logo, lot number, type number, rated capacitance (coded), capacitance tolerance (code letter), rated DC voltage, date of manufacture (coded)

Delivery mode

Bulk (untaped), Taped (Ammo pack or reels)

Dimensional drawing

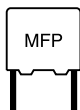


Dimensions in mm

Lead spacing	Lead diameter	Type
$e \pm 0.4$	$d_1 \pm 0.05$	
15.0	0.8	B32682
22.5	0.8	B32683
27.5	0.8	B32684
37.5	1.0	B32686

Overview of available types

Lead spacing	15.0 mm						22.5 mm						
Type	B32682						B32683						
Page	5						7						
V _R (V DC)	400	630	1000	1250	1600	2000	400	630	1000	1250	1600	2000	2500
C _R (nF)													
0.47													
0.68													
1.0													
1.5													
2.2													
3.3													
4.7													
6.8													
10													
15													
22													
33													
47													
68													
100													
150													

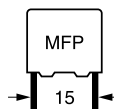


B32682 ... B32686

Very high pulse (wound)

Overview of available types

Lead spacing	27.5 mm						37.5 mm					
Type	B32684						B32686					
Page	9						10					
V_R (V DC)	400	630	1000	1250	1600	2000	630	1000	1250	1600	2000	
C_R (nF)												
15												
22												
33												
47												
68												
100												
150												
220												
330												
470												
680												
1000												
1500												


Ordering codes and packing units (lead spacing 15 mm)

V_R	V_{RMS} $f \leq 1$ kHz	C_R	Max. dimensions $w \times h \times l$ mm	Ordering code (composition see below)	Straight terminals, Ammo pack pcs./MOQ	Straight terminals, Reel pcs./MOQ	Straight terminals, Untaped pcs./MOQ
V DC	V AC	nF					
400	250	15.0	$5.0 \times 10.5 \times 18.0$	B32682A4153+***	4680	5200	4000
		22.0	$6.0 \times 11.0 \times 18.0$	B32682A4223+***	3840	4400	4000
		33.0	$7.0 \times 12.5 \times 18.0$	B32682A4333+***	3320	3600	4000
		47.0	$8.5 \times 14.5 \times 18.0$	B32682A4473+***	2720	2800	2000
630	300	4.7	$5.0 \times 10.5 \times 18.0$	B32682A6472+***	4680	5200	4000
		6.8	$5.0 \times 10.5 \times 18.0$	B32682A6682+***	4680	5200	4000
		10.0	$5.0 \times 10.5 \times 18.0$	B32682A6103+***	4680	5200	4000
		15.0	$6.0 \times 11.0 \times 18.0$	B32682A6153+***	3840	4400	4000
		22.0	$7.0 \times 12.5 \times 18.0$	B32682A6223+***	3320	3600	4000
		33.0	$8.5 \times 14.5 \times 18.0$	B32682A6333+***	2720	2800	2000
1000	400	47.0	$9.0 \times 17.5 \times 18.0$	B32682A6473+***	2560	2800	2000
		3.3	$5.0 \times 10.5 \times 18.0$	B32682A0332+***	4680	5200	4000
		4.7	$5.0 \times 10.5 \times 18.0$	B32682A0472+***	4680	5200	4000
		6.8	$6.0 \times 12.0 \times 18.0$	B32682A0682+***	3840	4400	4000
1250	450	10.0	$7.0 \times 12.5 \times 18.0$	B32682A0103+***	3320	3600	4000
		15.0	$8.5 \times 14.5 \times 18.0$	B32682A0153+***	2720	2800	2000
		2.2	$5.0 \times 10.5 \times 18.0$	B32682A7222+***	4680	5200	4000
		3.3	$5.0 \times 10.5 \times 18.0$	B32682A7332+***	4680	5200	4000
		4.7	$6.0 \times 12.0 \times 18.0$	B32682A7472+***	3840	4400	4000
		6.8	$7.0 \times 12.5 \times 18.0$	B32682A7682+***	3320	3600	4000
		10.0	$8.5 \times 14.5 \times 18.0$	B32682A7103+***	2720	2800	2000

MOQ = Minimum Order Quantity, consisting of 4 packing units.

Intermediate capacitances values on request.

Composition of ordering code

+ = Capacitance tolerance code:

M = $\pm 20\%$

K = $\pm 10\%$

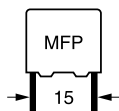
J = $\pm 5\%$

*** = Packaging code:

289 = Straight terminals, Ammo pack

189 = Straight terminals, Reel

000 = Straight terminals, untaped (lead length
6 - 1 mm)


B32682
Very high pulse (wound)
Ordering codes and packing units (lead spacing 15 mm)

V_R	V_{RMS} $f \leq 1 \text{ kHz}$	C_R	Max. dimensions $w \times h \times l$ mm	Ordering code (composition see below)	Straight terminals, Ammo pack pcs./MOQ	Straight terminals, Reel pcs./MOQ	Straight terminals, Untaped pcs./MOQ
V DC	V AC	nF					
1600	500	1.5	$5.0 \times 10.5 \times 18.0$	B32682A1152+***	4680	5200	4000
		2.2	$6.0 \times 11.0 \times 18.0$	B32682A1222+***	3840	4400	4000
		3.3	$7.0 \times 12.5 \times 18.0$	B32682A1332+***	3320	3600	4000
		4.7	$8.5 \times 14.5 \times 18.0$	B32682A1472+***	2720	2800	2000
		6.8	$9.0 \times 17.5 \times 18.0$	B32682A1682+***	2560	2800	2000
2000	550	0.47	$5.0 \times 10.5 \times 18.0$	B32682A2471M***	4680	5200	4000
		0.68	$5.0 \times 10.5 \times 18.0$	B32682A2681M***	4680	5200	4000
		1.0	$5.0 \times 10.5 \times 18.0$	B32682A2102+***	4680	5200	4000
		1.5	$6.0 \times 12.0 \times 18.0$	B32682A2152+***	3840	4400	4000
		2.2	$7.0 \times 12.5 \times 18.0$	B32682A2222+***	3320	3600	4000
		3.3	$8.5 \times 14.5 \times 18.0$	B32682A2332+***	2720	2800	2000

MOQ = Minimum Order Quantity, consisting of 4 packing units.

Intermediate capacitances values on request.

Composition of ordering code

+ = Capacitance tolerance code:

M = $\pm 20\%$

K = $\pm 10\%$

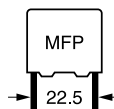
J = $\pm 5\%$

*** = Packaging code:

289 = Straight terminals, Ammo pack

189 = Straight terminals, Reel

000 = Straight terminals, untaped (lead length
6 - 1 mm)


Ordering codes and packing units (lead spacing 22.5 mm)

V_R	V_{RMS} $f \leq 1$ kHz	C_R	Max. dimensions $w \times h \times l$ mm	Ordering code (composition see below)	Straight terminals, Ammo pack pcs./MOQ	Straight terminals, Reel pcs./MOQ	Straight terminals, Untaped pcs./MOQ
V DC	V AC	nF					
400	250	33.0	$6.0 \times 15.0 \times 26.5$	B32683A4333+***	2720	2800	2880
		47.0	$6.0 \times 15.0 \times 26.5$	B32683A4473+***	2720	2800	2880
		68.0	$7.0 \times 16.0 \times 26.5$	B32683A4683+***	2320	2400	2520
		100.0	$8.5 \times 16.5 \times 26.5$	B32683A4104+***	1920	2000	2040
		150.0	$10.5 \times 18.5 \times 26.5$	B32683A4154+***	1560	1600	2160
630	300	33.0	$6.0 \times 15.0 \times 26.5$	B32683A6333+***	2720	2800	2880
		47.0	$7.0 \times 16.0 \times 26.5$	B32683A6473+***	2320	2400	2520
		68.0	$8.5 \times 16.5 \times 26.5$	B32683A6683+***	1920	2000	2040
		100.0	$10.5 \times 18.5 \times 26.5$	B32683A6104+***	1560	1600	2160
		150.0	$12.0 \times 22.0 \times 26.5$	B32683A6154+***	—	—	1800
1000	400	10.0	$6.0 \times 15.0 \times 26.5$	B32683A0103+***	2720	2800	2880
		15.0	$6.0 \times 15.0 \times 26.5$	B32683A0153+***	2720	2800	2880
		22.0	$7.0 \times 16.0 \times 26.5$	B32683A0223+***	2320	2400	2520
		33.0	$8.5 \times 16.5 \times 26.5$	B32683A0333+***	1920	2000	2040
		47.0	$10.5 \times 18.5 \times 26.5$	B32683A0473+***	1560	1600	2160
		68.0	$12.0 \times 22.0 \times 26.5$	B32683A0683+***	—	—	1800
1250	450	10.0	$6.0 \times 15.0 \times 26.5$	B32683A7103+***	2720	2800	2880
		15.0	$7.0 \times 16.0 \times 26.5$	B32683A7153+***	2320	2400	2520
		22.0	$8.5 \times 16.5 \times 26.5$	B32683A7223+***	1920	2000	2040
		33.0	$10.5 \times 18.5 \times 26.5$	B32683A7333+***	1560	1600	2160
1600	500	6.8	$6.0 \times 15.0 \times 26.5$	B32683A1682+***	2720	2800	2880
		10.0	$7.0 \times 16.0 \times 26.5$	B32683A1103+***	2320	2400	2520
		15.0	$8.5 \times 16.5 \times 26.5$	B32683A1153+***	1920	2000	2040
		22.0	$10.5 \times 18.5 \times 26.5$	B32683A1223+***	1560	1600	2160

MOQ = Minimum Order Quantity, consisting of 4 packing units.

Intermediate capacitances values on request.

Composition of ordering code

+ = Capacitance tolerance code:

M = $\pm 20\%$

K = $\pm 10\%$

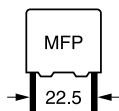
J = $\pm 5\%$

*** = Packaging code:

289 = Straight terminals, Ammo pack

189 = Straight terminals, Reel

000 = Straight terminals, untaped (lead length
6 - 1 mm)


B32683
Very high pulse (wound)
Ordering codes and packing units (lead spacing 22.5 mm)

V_R	V_{RMS} $f \leq 1 \text{ kHz}$	C_R	Max. dimensions $w \times h \times l$ mm	Ordering code (composition see below)	Straight terminals, Ammo pack pcs./MOQ	Straight terminals, Reel pcs./MOQ	Straight terminals, Untaped pcs./MOQ
V DC	V AC	nF					
2000	550	3.3	$6.0 \times 15.0 \times 26.5$	B32683A2332+***	2720	2800	2880
		4.7	$6.0 \times 15.0 \times 26.5$	B32683A2472+***	2720	2800	2880
		6.8	$7.0 \times 16.0 \times 26.5$	B32683A2682+***	2320	2400	2520
		10.0	$8.5 \times 16.5 \times 26.5$	B32683A2103+***	1920	2000	2040
		15.0	$10.5 \times 18.5 \times 26.5$	B32683A2153+***	1560	1600	2160
2500	750	1.5	$6.0 \times 15.0 \times 26.5$	B32683A3152+***	2720	2800	2880
		2.2	$7.0 \times 16.0 \times 26.5$	B32683A3222+***	2320	2400	2520
		3.3	$8.5 \times 16.5 \times 26.5$	B32683A3332+***	1920	2000	2040
		4.7	$10.5 \times 18.5 \times 26.5$	B32683A3472+***	1560	1600	2160
		6.8	$12.0 \times 22.0 \times 26.5$	B32683A3682+***	—	—	1800

MOQ = Minimum Order Quantity, consisting of 4 packing units.

Intermediate capacitances values on request.

Composition of ordering code

+ = Capacitance tolerance code:

M = $\pm 20\%$

K = $\pm 10\%$

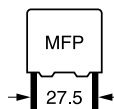
J = $\pm 5\%$

*** = Packaging code:

289 = Straight terminals, Ammo pack

189 = Straight terminals, Reel

000 = Straight terminals, untaped (lead length
6 - 1 mm)


Ordering codes and packing units (lead spacing 27.5 mm)

V_R	V_{RMS} $f \leq 1 \text{ kHz}$	C_R	Max. dimensions $w \times h \times l$ mm	Ordering code (composition see below)	Straight terminals, Untaped pcs./MOQ
V DC	V AC	nF			
400	250	150.0	$11.0 \times 19.0 \times 31.5$	B32684A4154+000	1280
		220.0	$11.0 \times 21.0 \times 31.5$	B32684A4224+000	1280
		330.0	$13.5 \times 23.0 \times 31.5$	B32684A4334+000	1040
		470.0	$18.0 \times 27.5 \times 31.5$	B32684A4474+000	800
		680.0	$19.0 \times 30.0 \times 31.5$	B32684A4684+000	720
630	300	100.0	$11.0 \times 19.0 \times 31.5$	B32684A6104+000	1280
		150.0	$11.0 \times 21.0 \times 31.5$	B32684A6154+000	1280
		220.0	$13.5 \times 23.0 \times 31.5$	B32684A6224+000	1040
		330.0	$15.0 \times 24.5 \times 31.5$	B32684A6334+000	960
		470.0	$19.0 \times 30.0 \times 31.5$	B32684A6474+000	720
1000	400	47.0	$11.0 \times 19.0 \times 31.5$	B32684A0473+000	1280
		68.0	$11.0 \times 21.0 \times 31.5$	B32684A0683+000	1280
		100.0	$13.5 \times 23.0 \times 31.5$	B32684A0104+000	1040
		150.0	$18.0 \times 27.5 \times 31.5$	B32684A0154+000	800
		220.0	$21.0 \times 31.0 \times 31.5$	B32684A0224+000	784
1250	450	33.0	$11.0 \times 19.0 \times 31.5$	B32684A7333+000	1280
		47.0	$11.0 \times 21.0 \times 31.5$	B32684A7473+000	1280
		68.0	$13.5 \times 23.0 \times 31.5$	B32684A7683+000	1040
		100.0	$15.0 \times 24.5 \times 31.5$	B32684A7104+000	960
		150.0	$19.0 \times 30.0 \times 31.5$	B32684A7154+000	720
1600	500	22.0	$11.0 \times 19.0 \times 31.5$	B32684A1223+000	1280
		33.0	$11.0 \times 21.0 \times 31.5$	B32684A1333+000	1280
		47.0	$13.5 \times 23.0 \times 31.5$	B32684A1473+000	1040
		68.0	$15.0 \times 24.5 \times 31.5$	B32684A1683+000	960
		100.0	$19.0 \times 30.0 \times 31.5$	B32684A1104+000	720
2000	550	15.0	$11.0 \times 19.0 \times 31.5$	B32684A2153+000	1280
		22.0	$11.0 \times 21.0 \times 31.5$	B32684A2223+000	1280
		33.0	$13.5 \times 23.0 \times 31.5$	B32684A2333+000	1040
		47.0	$18.0 \times 27.5 \times 31.5$	B32684A2473+000	800
		68.0	$19.0 \times 30.0 \times 31.5$	B32684A2683+000	720

MOQ = Minimum Order Quantity, consisting of 4 packing units.

Intermediate capacitances values on request.

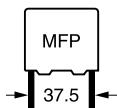
Composition of ordering code

+ = Capacitance tolerance code:

M = $\pm 20\%$

K = $\pm 10\%$

J = $\pm 5\%$


B32686
Very high pulse (wound)
Ordering codes and packing units (lead spacing 37.5 mm)

V_R	V_{RMS} $f \leq 1 \text{ kHz}$	C_R	Max. dimensions $w \times h \times l$ mm	Ordering code (composition see below)	Straight terminals, Untaped pcs./MOQ
V DC	V AC	nF			
630	300	680.0	$18.0 \times 32.5 \times 42.0$	B32686A6684+000	192
		1000.0	$20.0 \times 39.5 \times 42.0$	B32686A6105+000	128
		1500.0	$28.0 \times 42.5 \times 42.0$	B32686A6155+000	216
1000	400	68.0	$12.0 \times 22.0 \times 42.0$	B32686A0683+000	288
		100.0	$12.0 \times 22.0 \times 42.0$	B32686A0104+000	288
		150.0	$14.0 \times 25.0 \times 42.0$	B32686A0154+000	224
		220.0	$16.0 \times 28.5 \times 42.0$	B32686A0224+000	192
		330.0	$20.0 \times 39.5 \times 42.0$	B32686A0334+000	128
		470.0	$28.0 \times 37.0 \times 42.0$	B32686A0474+000	128
1250	450	68.0	$12.0 \times 22.0 \times 42.0$	B32686A7683+000	288
		100.0	$14.0 \times 25.0 \times 42.0$	B32686A7104+000	224
		150.0	$16.0 \times 28.5 \times 42.0$	B32686A7154+000	192
		220.0	$18.0 \times 32.5 \times 42.0$	B32686A7224+000	192
		330.0	$20.0 \times 39.5 \times 42.0$	B32686A7334+000	128
1600	500	47.0	$12.0 \times 22.0 \times 42.0$	B32686A1473+000	288
		68.0	$14.0 \times 25.0 \times 42.0$	B32686A1683+000	224
		100.0	$18.0 \times 32.5 \times 42.0$	B32686A1104+000	192
		150.0	$20.0 \times 39.5 \times 42.0$	B32686A1154+000	192
		220.0	$28.0 \times 37.0 \times 42.0$	B32686A1224+000	216
2000	550	22.0	$12.0 \times 22.0 \times 42.0$	B32686A2223+000	288
		33.0	$12.0 \times 22.0 \times 42.0$	B32686A2333+000	288
		47.0	$14.0 \times 25.0 \times 42.0$	B32686A2473+000	224
		68.0	$16.0 \times 28.5 \times 42.0$	B32686A2683+000	192
		100.0	$18.0 \times 32.5 \times 42.0$	B32686A2104+000	192

MOQ = Minimum Order Quantity, consisting of 4 packing units.

Intermediate capacitances values on request.

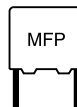
Composition of ordering code

+ = Capacitance tolerance code:

M = $\pm 20\%$

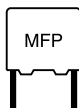
K = $\pm 10\%$

J = $\pm 5\%$



Technical data

Operating temperature range	Max. operating temperature $T_{op,max}$				+110 °C
	Upper category temperature T_{max}				+100 °C
	Lower category temperature T_{min}				−55 °C
	Rated DC temperature T_{RDC}				+85 °C
	Rated AC temperature T_{RAC}				+75 °C
Voltage Derating	The rated voltage is decreased with 1.25%/°C between rated temperature and +100 °C				
Dissipation factor $\tan \delta$ at 20 °C (upper limit values)	at 1 kHz 10 kHz 100 kHz	$C_R \leq 0.1 \mu F$ 0.0004 0.0004 0.001	$0.1 \mu F < C_R \leq 1 \mu F$ 0.0004 0.0006 —	$C_R > 1 \mu F$ 0.0004 — —	
Insulation resistance R_{ins} or time constant $t = C_R \times R_{ins}$ at 20 °C, rel. humidity $\leq 65\%$ (minimum as-delivered values)	$C_R \leq 0.33 \mu F$ 100 GΩ		$C_R > 0.33 \mu F$ 30000 s		
DC test voltage	$2.0 \cdot V_R, 2 s$				
Category voltage V_C	T_A (°C)	DC voltage derating		AC voltage derating	
V_{DC} continuous operation	$T_A \leq 85$	$V_C = V_R$			
	$85 < T_A \leq 100$	$V_C = V_R \cdot (165 - T_A)/80$			
V_{AC} continuous operation at $f \leq 1$ kHz	$T_A \leq 85$			$V_C = V_{RMS}$	
	$75 < T_A \leq 100$			$V_{C,RMS} = V_{RMS} \cdot (155 - T_A)/80$	
Damp heat test	56 days/40 °C/93% relative humidity				
Limit values after damp	Capacitance change $ \Delta C/C $		$\leq 2\%$		
heat test	Dissipation factor change $\Delta \tan \delta$		$\leq 1.0 \cdot 10^{-3}$ (at 10 kHz)		
	Insulation resistance R_{ins}		$\geq 50\%$ of minimum as delivered values		
Reliability:					
Endurance test AC	$1.25 \cdot V_C / 85 \text{ °C} / 1000 h$				
Endurance test DC	$1.25 \cdot V_C / 85 \text{ °C} / 100 \text{ °C} / 1000 h$				
Failure rate λ	1 fit ($\leq 2 \cdot 10^{-3}$ 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:					
Total failure	Short circuit or open circuit				
Failure due to variation of parameters	Capacitance change $ \Delta C/C $		$> 10\%$		
	Dissipation factor $\tan \delta$		$> 4 \cdot$ upper limit value		
	Insulation resistance R_{ins}		$< 1500 M\Omega$ ($C_R \leq 0.33 \mu F$)		
	or time constant $t = C_R \cdot R_{ins}$		$< 500 s$ ($C_R > 0.33 \mu F$)		



B32682 ... B32686

Very high pulse (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:

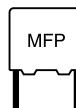
The values of dV/dt and k₀ provided below must not be exceeded in order to avoid damaging the capacitor.

dV/dt values

Lead spacing		15 mm	22.5 mm	27.5 mm	37.5 mm
V _R V DC	V _{RMS} V AC	dV/dt in V/ μ s			
400	250	7 000	5 000	4 000	—
630	300	12 000	7 000	5 000	3 000
1000	400	15 000	11 000	9 000	5 000
1250	450	27 000	11 000	9 000	6 000
1600	500	27 000	17 000	11 000	9 000
2000	550	39 000	21 000	11 000	9 000
2500	750	—	21 000	—	—

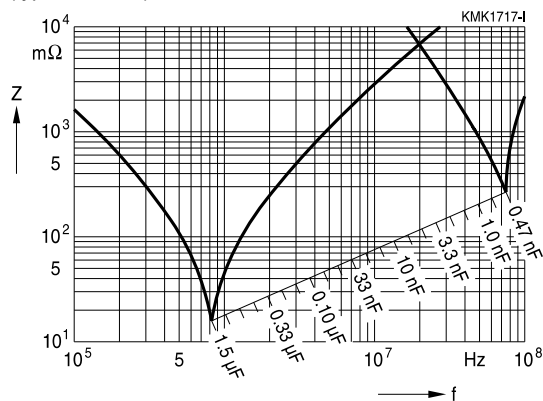
k₀ values

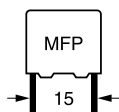
Lead spacing		15 mm	22.5 mm	27.5 mm	37.5 mm
V _R V DC	V _{RMS} V AC	k ₀ in V ² / μ s			
400	250	5 600 000	4 000 000	3 200 000	—
630	300	15 120 000	8 820 000	6 300 000	3 780 000
1000	400	30 000 000	22 000 000	18 000 000	10 000 000
1250	450	67 500 000	27 500 000	22 500 000	15 000 000
1600	500	86 400 000	54 400 000	35 200 000	28 800 000
2000	550	156 000 000	84 000 000	44 000 000	36 000 000
2500	750	—	105 000 000	—	—



Impedance Z versus frequency f

(typical values)





B32682

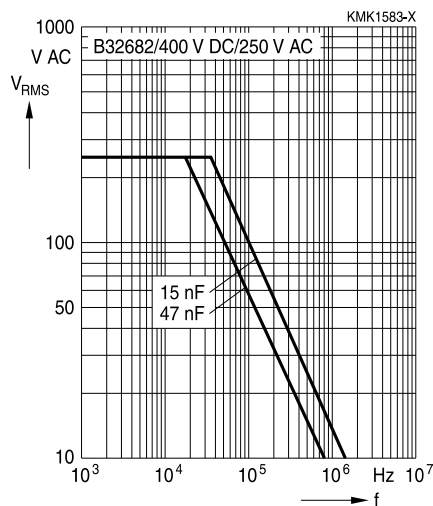
Very high pulse (wound)

Permissible AC voltage V_{RMS} versus frequency f (for sinusoidal waveforms, $T_A \leq 90^\circ\text{C}$)

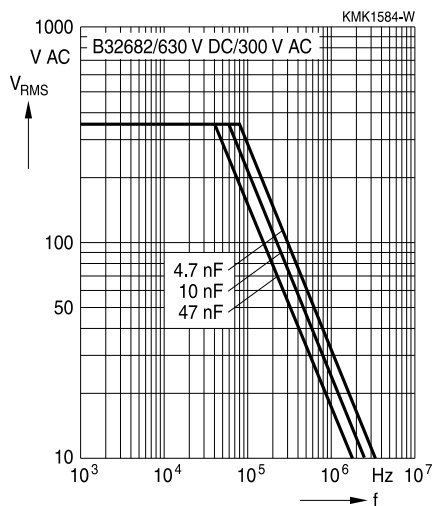
For $T_A > 90^\circ\text{C}$, please refer to "General technical information", section 3.2.3.

Lead spacing 15 mm

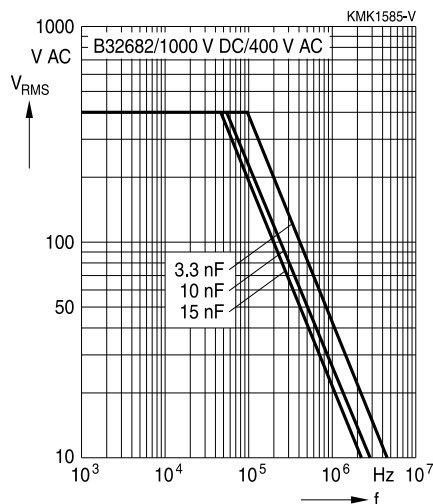
400 V DC/250 V AC



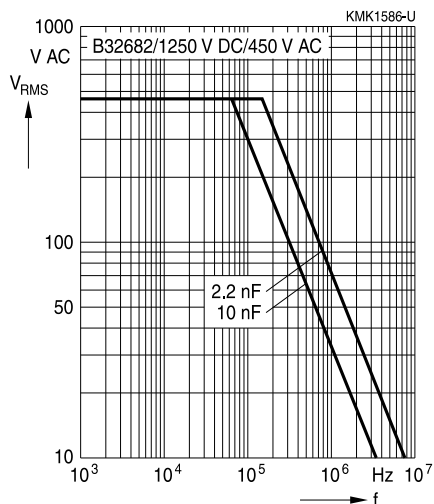
630 V DC/300 V AC

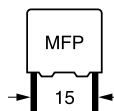


1000 V DC/400 V AC



1250 V DC/450 V AC



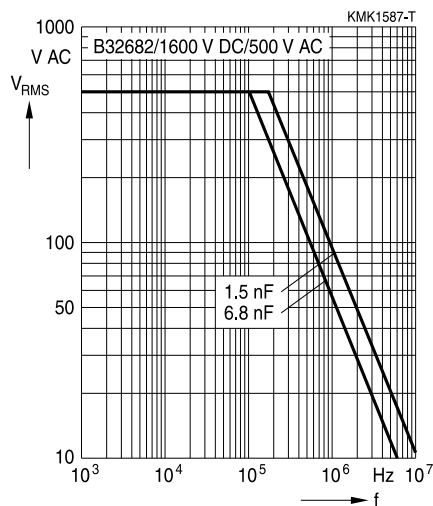


Permissible AC voltage V_{RMS} versus frequency f (for sinusoidal waveforms, $T_A \leq 90^\circ\text{C}$)

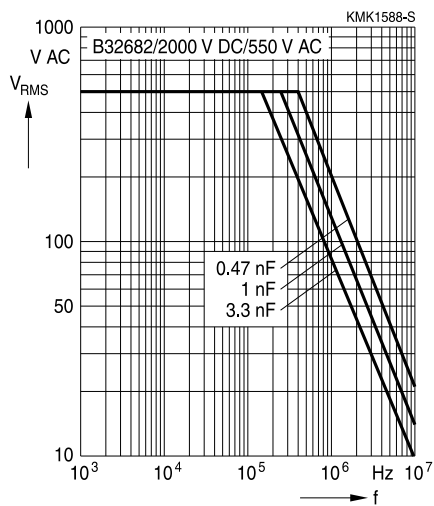
For $T_A > 90^\circ\text{C}$, please refer to "General technical information", section 3.2.3.

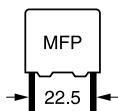
Lead spacing 15 mm

1600 V DC/500 V AC



2000 V DC/550 V AC





B32683

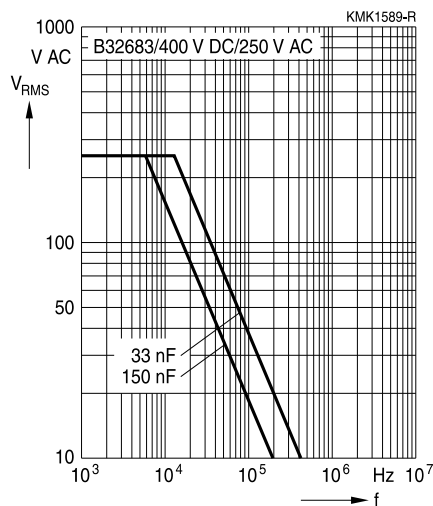
Very high pulse (wound)

Permissible AC voltage V_{RMS} versus frequency f (for sinusoidal waveforms, $T_A \leq 90^\circ\text{C}$)

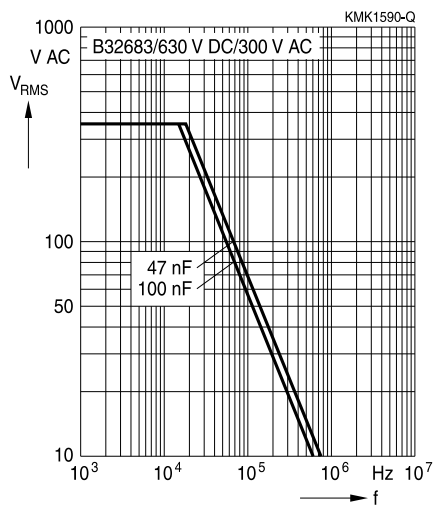
For $T_A > 90^\circ\text{C}$, please refer to "General technical information", section 3.2.3.

Lead spacing 22.5 mm

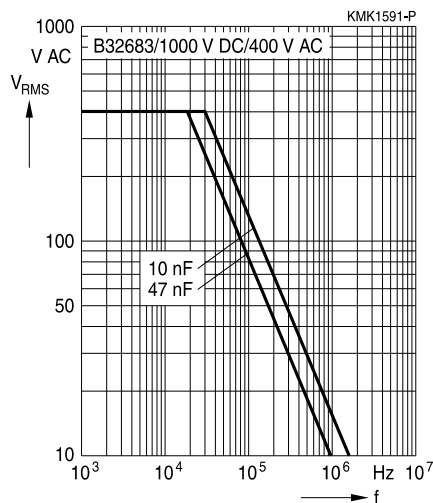
400 V DC/250 V AC



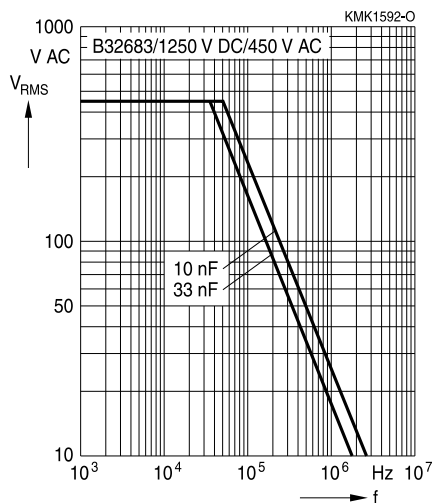
630 V DC/300 V AC

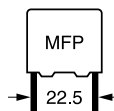


1000 V DC/400 V AC



1250 V DC/450 V AC



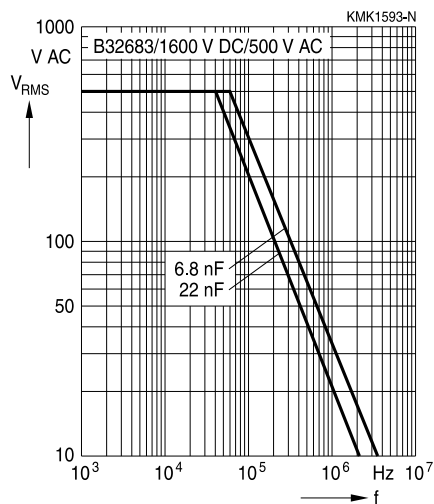


Permissible AC voltage V_{RMS} versus frequency f (for sinusoidal waveforms, $T_A \leq 90^\circ\text{C}$)

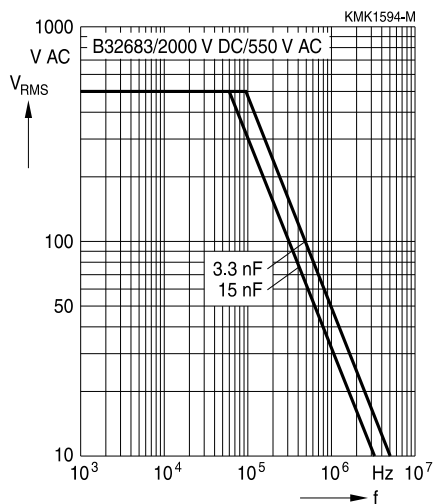
For $T_A > 90^\circ\text{C}$, please refer to "General technical information", section 3.2.3.

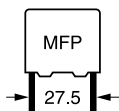
Lead spacing 22.5 mm

1600 V DC/500 V AC



2000 V DC/550 V AC





B32684

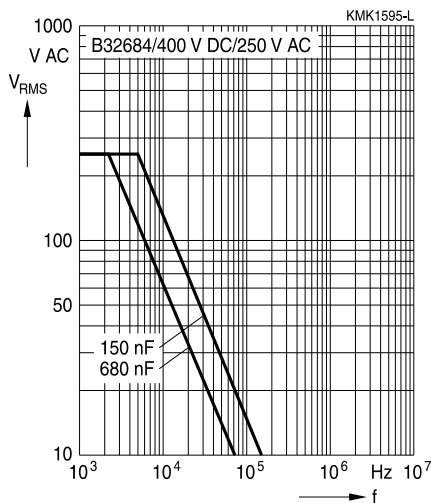
Very high pulse (wound)

Permissible AC voltage V_{RMS} versus frequency f (for sinusoidal waveforms, $T_A \leq 90^\circ\text{C}$)

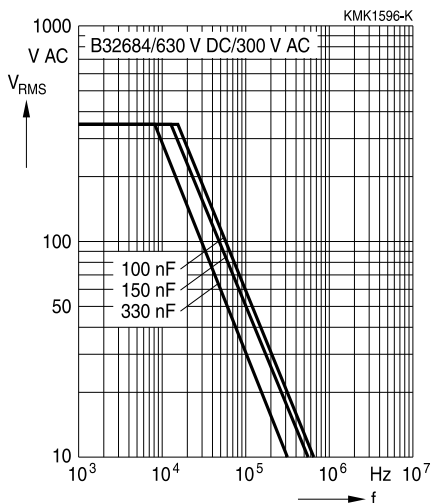
For $T_A > 90^\circ\text{C}$, please refer to "General technical information", section 3.2.3.

Lead spacing 27.5 mm

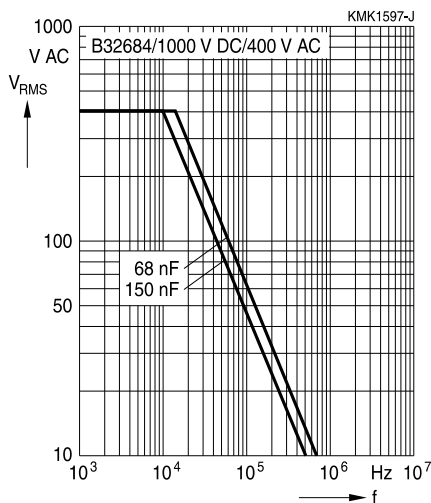
400 V DC/250 V AC



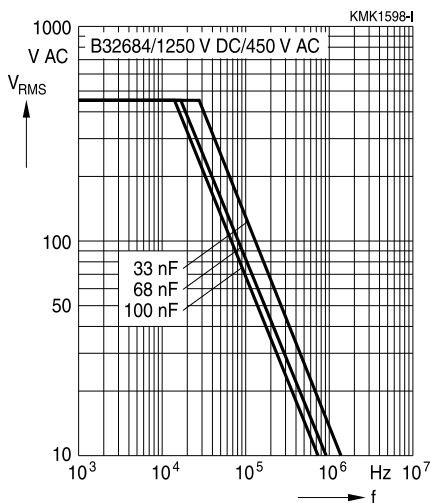
630 V DC/300 V AC



1000 V DC/400 V AC

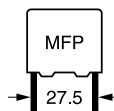


1250 V DC/450 V AC



B32684

Very high pulse (wound)

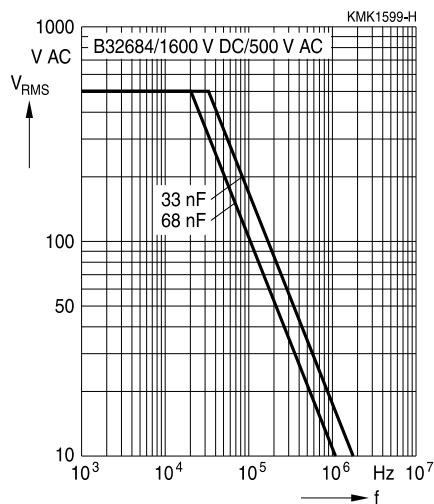


Permissible AC voltage V_{RMS} versus frequency f (for sinusoidal waveforms, $T_A \leq 90^\circ\text{C}$)

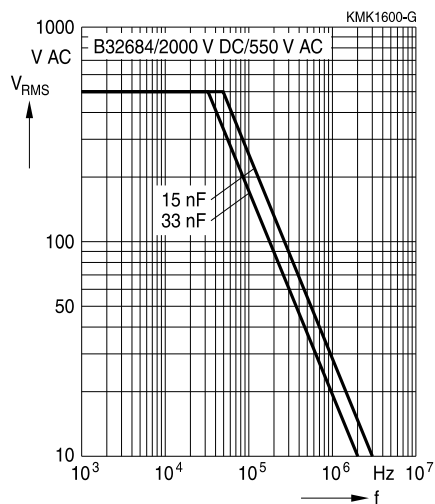
For $T_A > 90^\circ\text{C}$, please refer to "General technical information", section 3.2.3.

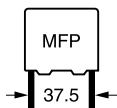
Lead spacing 27.5 mm

1600 V DC/500 V AC



2000 V DC/550 V AC





B32686

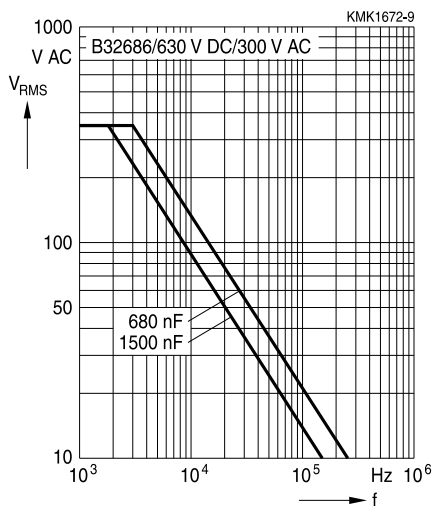
Very high pulse (wound)

Permissible AC voltage V_{RMS} versus frequency f (for sinusoidal waveforms, $T_A \leq 90^\circ\text{C}$)

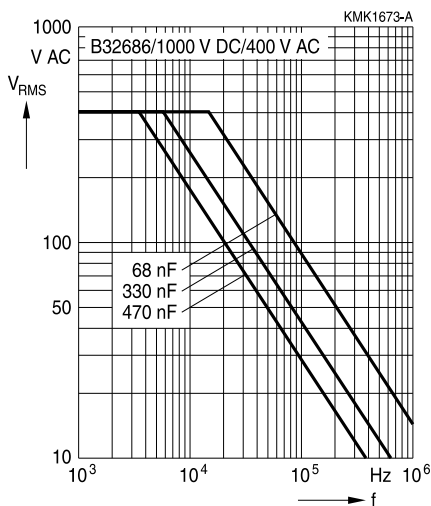
For $T_A > 90^\circ\text{C}$, please refer to "General technical information", section 3.2.3.

Lead spacing 37.5 mm

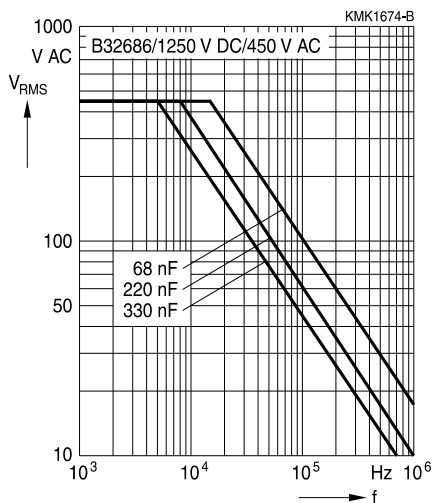
630 V DC/300 V AC



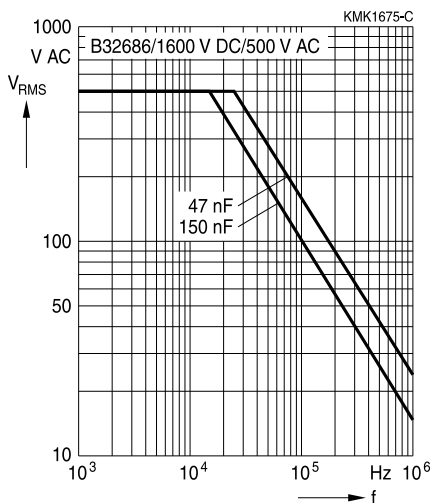
1000 V DC/400 V AC

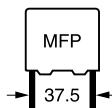


1250 V DC/450 V AC



1600 V DC/500 V AC



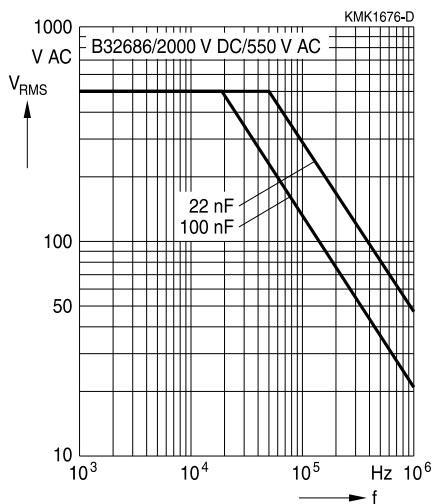


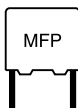
Permissible AC voltage V_{RMS} versus frequency f (for sinusoidal waveforms, $T_A \leq 90^\circ\text{C}$)

For $T_A > 90^\circ\text{C}$, please refer to "General technical information", section 3.2.3.

Lead spacing 37.5 mm

2000 V DC/550 V AC





B32682 ... B32686

Very high pulse (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.

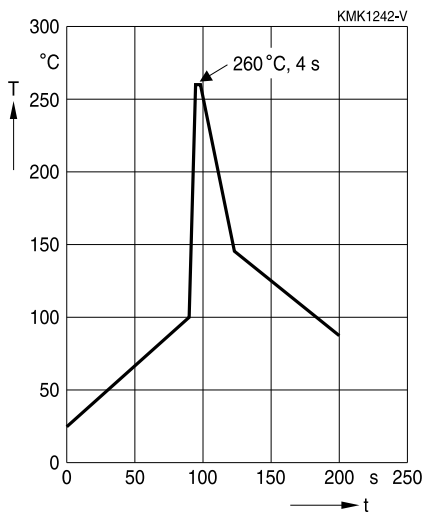
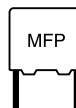
Solder bath temperature	235 ±5 °C
Soldering time	2.0 ±0.5 s
Immersion depth	2.0 +0/−0.5 mm from capacitor body or seating plane
Evaluation criteria:	
Visual inspection	Wetting of wire surface by new solder ≥90%, free-flowing solder

1.2 Resistance to soldering heat

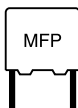
Resistance to soldering heat is tested to IEC 60068-2-20, test Tb, method 1A.

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



B32682 ... B32686

Very high pulse (wound)

1.3 General notes on soldering

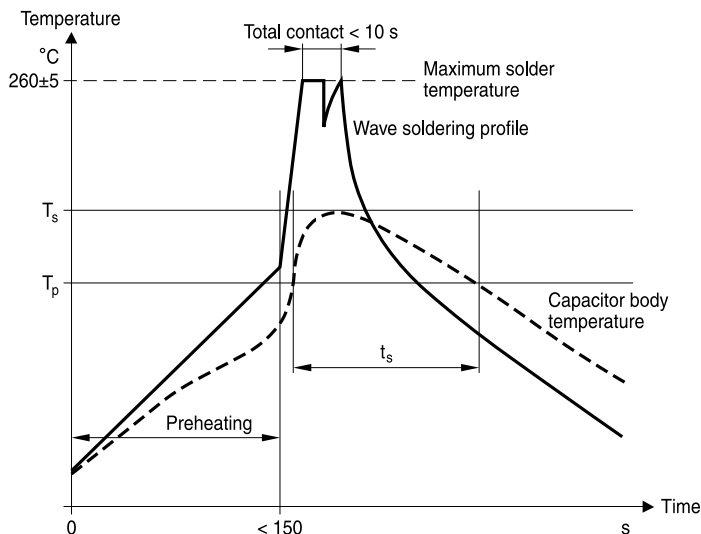
Permissible heat exposure loads on film capacitors are primarily characterized by the upper category temperature $T_{\max}$. Long exposure to temperatures above this type-related temperature limit can lead to changes in the plastic dielectric and thus change irreversibly a capacitor's electrical characteristics. 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 recommendations

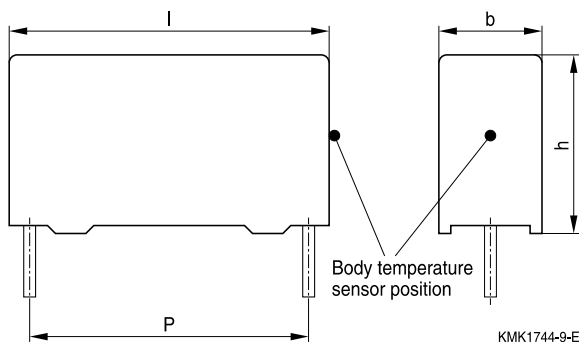
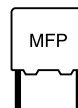
As a reference, the recommended wave soldering profile for our film capacitors is as follows:



T_s : Capacitor body maximum temperature at wave soldering

T_p : Capacitor body maximum temperature at pre-heating

KMK1745-A



Body temperature should follow the description below:

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

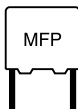
When SMD components are used together with leaded ones, the film capacitors should not pass into the SMD adhesive curing oven. The leaded components should be assembled after the SMD curing step.

Leaded film capacitors are not suitable for reflow soldering.

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 °C in the preheater phase
- rapid cooling after soldering

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



B32682 ... B32686

Very high pulse (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.

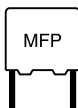
The table below summarizes the safety instructions that must always be observed. A detailed description can be found in the relevant sections of the chapters "General technical information" and "Mounting guidelines".

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

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

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.

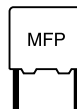


B32682 ... B32686

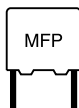
Very high pulse (wound)

Symbols and terms

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



Symbol	English	German
I_{RMS}	(Sinusoidal) alternating current, root-mean-square value	(Sinusförmiger) Wechselstrom
i_z	Capacitance drift	Inkonstanz der Kapazität
k_0	Pulse characteristic	Impulskennwert
L_S	Series inductance	Serieninduktivität
λ	Failure rate	Ausfallrate
λ_0	Constant failure rate during useful service life	Konstante Ausfallrate in der Nutzungsphase
λ_{test}	Failure rate, determined by tests	Experimentell ermittelte Ausfallrate
P_{diss}	Dissipated power	Abgegebene Verlustleistung
P_{gen}	Generated power	Erzeugte Verlustleistung
Q	Heat energy	Wärmeenergie
ρ	Density of water vapor in air	Dichte von Wasserdampf in Luft
R	Universal molar constant for gases	Allg. Molarkonstante für Gas
R	Ohmic resistance of discharge circuit	Ohmscher Widerstand des Entladekreises
R_i	Internal resistance	Innenwiderstand
R_{ins}	Insulation resistance	Isolationswiderstand
R_P	Parallel resistance	Parallelwiderstand
R_S	Series resistance	Serienwiderstand
S	severity (humidity test)	Schärfegrad (Feuchtetest)
t	Time	Zeit
T	Temperature	Temperatur
τ	Time constant	Zeitkonstante
$\tan \delta$	Dissipation factor	Verlustfaktor
$\tan \delta_D$	Dielectric component of dissipation factor	Dielektrischer Anteil des Verlustfaktors
$\tan \delta_P$	Parallel component of dissipation factor	Parallelanteil des 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



B32682 ... B32686

Very high pulse (wound)

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.