

# **Film Capacitors**

Metallized Polypropylene Film Capacitors (MFP)

**Series/Type: B32632 ... B32634**Date: August 2004

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Metallized polypropylene film capacitors (MFP)

B32632 ... B32634

### High pulse (wound)

### **Typical applications**

- Smoothing
- High-frequency AC loads
- TV (flyback)

### 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
- Contact layer of sprayed metal
- Wound capacitor technology
- Epoxy resin coating (UL 94 V-0)

### **Features**

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

### Terminals

- Crimped wire leads, lead-free tinned, lead length (6 −1 mm) or min. 20 mm
- Double crimped wire leads, lead-free tinned
- Straight wire leads, lead-free tinned, lead length (17 ±3 mm)
- $\blacksquare$  Different lead spacings (reduced and enlarged) available, lead length (6 -1 mm)

#### Marking

Manufacturer's logo, style and type (P6xx), rated capacitance (coded), capacitance tolerance (code letter), rated DC voltage, date of manufacture (coded)

### **Delivery mode**

Bulk (untaped)

Taped (Ammo pack or reel)

For notes on taping, refer to chapter "Taping and packing".



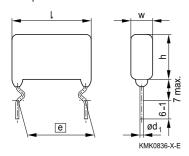


## High pulse (wound)

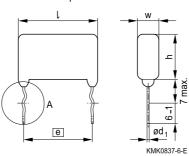


### **Dimensional drawings**

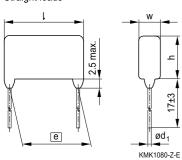
### Crimped leads



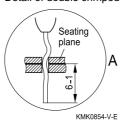
Double crimped leads



Straight leads



Detail of double crimped version



Dimensions in mm

Lead spacing	Lead diameter	Туре
15.0	0.8	B32632
22.5	0.8	B32633
27.5	0.8	B32634





## High pulse (wound)

### Overview of available types

Lead spacing 15.0 mm				22.5 mm							
Туре	B3263	2				B32633					
V <sub>R</sub> (VDC)	630	1250	1600	2000	3000	630	1250	1600	2000	2500	3000
V <sub>rms</sub> (VAC)	300	450	450	500	800	300	450	450	500	750	800
C <sub>R</sub> (nF)											
0.47											
0.68											
1.0											
1.5											
2.2											
3.3											
4.7											
6.8											
10											
15											
22											
33											<u> </u>
47											
68											
100											

## Lead configurations

Series	Standard	Reduced	Enlarged	Straight	Double crimped
	<b>F</b>	$\bigcap$			
B32632	15 mm	7.5 / 10 / 12.5 mm	17.5 mm	15 mm	15 mm
B32633	22.5 mm	15 / 17.5 / 20 mm	25 mm	22.5 mm	22.5 mm
B32634	27.5 mm	25 mm	_	27.5 mm	27.5 mm



# High pulse (wound)



### Overview of available types

Lead spacin	g 27.5 mm			
Туре	B32634			
V <sub>R</sub> (VDC)	630	1250	1600	2000
V <sub>rms</sub> (VAC)	300	450	450	500
C <sub>R</sub> (nF)				
10				
15				
22				
33				
47				
68				
100				
150				
220				
330				

## Lead configurations

Series	Standard	Reduced	Enlarged	Straight	Double crimped
		$\bigcap$			
B32632	15 mm	7.5 / 10 / 12.5 mm	17.5 mm	15 mm	15 mm
B32633	22.5 mm	15 / 17.5 / 20 mm	25 mm	22.5 mm	22.5 mm
B32634	27.5 mm	25 mm	_	27.5 mm	27.5 mm





### High pulse (wound)

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

$\overline{V_R}$	$V_{rms}$	C <sub>R</sub>	Max. dimensions	Ordering code	Ammo	Reel	Untaped
<b>▼</b> H	f ≤1 kHz	Он	$\mathbf{w} \times \mathbf{h} \times \mathbf{l}$	(composition see	pack		Sinapou
VDC	VAC	nF	mm	below)	•	pcs./unit	pcs./unit
630	300	2.2		B32632A6222+***	900	1200	1000
000	000	3.3		B32632A6332+***	900	1200	1000
		4.7	$6.0 \times 11.5 \times 19.0$	B32632A6472+***	900	1200	1000
		6.8		B32632A6682+***	900	1200	1000
		10	$6.0 \times 11.5 \times 19.0$	B32632A6103+***	900	1200	1000
		15	$7.0 \times 12.0 \times 19.0$	B32632A6153+***	800	1000	1000
		22	$8.0 \times 13.5 \times 19.0$	B32632A6223+***	700	900	1000
		33	$9.5 \times 15.5 \times 19.0$	B32632A6333+***	600	800	500
		47	$12.0\times17.0\times19.0$	B32632A6473+***	450	600	500
1250	450	1.0	$6.5 \times 11.5 \times 19.0$	B32632A7102+***	850	1100	1000
		1.5	$6.5\times11.5\times19.0$	B32632A7152+***	850	1100	1000
		2.2	$6.5\times12.0\times19.0$	B32632A7222+***	850	1100	1000
		3.3	$7.0\times12.5\times19.0$	B32632A7332+***	800	1000	1000
		4.7	$7.0\times12.5\times19.0$	B32632A7472+***	800	1000	1000
		6.8	$7.5\times14.0\times19.0$	B32632A7682+***	750	1000	1000
		10	$9.0\times15.5\times19.0$	B32632A7103+***	600	800	500
		15	$12.0\times16.5\times19.0$	B32632A7153+***	450	600	500
1600	450	1.0	$6.0\times11.5\times19.0$	B32632A1102+***	900	1200	1000
		1.5	$6.0\times11.5\times19.0$	B32632A1152+***	900	1200	1000
		2.2	$7.0\times12.0\times19.0$	B32632A1222+***	800	1000	1000
		3.3	$8.0\times13.5\times19.0$	B32632A1332+***	700	900	1000
		4.7	$9.5\times15.5\times19.0$	B32632A1472+***	600	800	1000
		6.8	$10.5\times16.0\times19.0$	B32632A1682+***	500	700	500
		10	$12.5 \times 17.5 \times 19.0$	B32632A1103+***	450	600	500

Further E series and intermediate capacitance values on request.

### Composition of ordering code

 + = Capacitance tolerance code:
 \*\*\* = Packaging code:

 K = ±10%
 289 = Ammo pack

 J = ±5%
 189 = Reel

020 = Double crimped (lead length 6 - 1 mm)

Lead configuration (lead length 6 −1 mm)	Reduced	Reduced	Reduced	Enlarged
Lead spacing (mm)	7.5 mm	10 mm	12.5 mm	17.5 mm
Packaging code	030	040	050	060



## High pulse (wound)



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

$V_R$	$V_{rms}$	C <sub>R</sub>	Max. dimensions	Ordering code	Ammo	Reel	Untaped
	f≤1 kHz		$w \times h \times I$	(composition see	pack		
VDC	VAC	nF	mm	below)	pcs./unit	pcs./unit	pcs./unit
2000	500	0.47	$6.5 \times 11.5 \times 19.0$	B32632A2471M***	850	1100	1000
		0.47	$6.5 \times 11.5 \times 19.0$	B32632A2471K***	850	1100	1000
		0.68	$6.5\times12.5\times19.0$	B32632A2681M***	850	1100	1000
		0.68	$6.5 \times 12.5 \times 19.0$	B32632A2681K***	850	1100	1000
		1.0	$6.5 \times 12.5 \times 19.0$	B32632A2102+***	850	1100	1000
		1.5	$6.5 \times 12.5 \times 19.0$	B32632A2152+***	850	1100	1000
		2.2	$7.0\times13.5\times19.0$	B32632A2222+***	800	1000	500
		3.3	$8.5 \times 15.0 \times 19.0$	B32632A2332+***	650	850	500
		4.7	$10.5 \times 16.0 \times 19.0$	B32632A2472+***	500	700	500
		6.8	$12.5 \times 17.5 \times 19.0$	B32632A2682+***	450	600	500
3000	800	0.47	$5.5 \times 11.0 \times 19.0$	B32632S4471+***	1000	1300	1000
		0.68	$6.0 \times 12.0 \times 19.0$	B32632S4681+***	900	1200	1000
		1.0	$7.5\times13.0\times19.0$	B32632S4102+***	750	1000	500
		1.5	$8.5 \times 14.5 \times 19.0$	B32632S4152+***	650	850	500
		2.2	$10.5 \times 16.0 \times 19.0$	B32632S4222+***	500	700	500
		3.3	$12.5 \times 18.0 \times 19.0$	B32632S4332+***	450	600	500

Further E series and intermediate capacitance values on request.

### Composition of ordering code

020 = Double crimped (lead length 6 - 1 mm)

Lead configuration (lead length 6 −1 mm)	Reduced	Reduced	Reduced	Enlarged
Lead spacing (mm)	7.5 mm	10 mm	12.5 mm	17.5 mm
Packaging code	030	040	050	060





### High pulse (wound)

### Ordering codes and packing units (lead spacing 22.5 mm)

$V_{R}$	V	C <sub>R</sub>	Max. dimensions	Ordering code	Ammo	Reel	Untaped
<b>v</b> <sub>R</sub>	V <sub>rms</sub> f≤1 kHz	∪ <sub>R</sub>		_		neei	oniaped
VDC		r	$W \times h \times I$	(composition see	pack		/:4
VDC	VAC	nF	mm	below)	•	pcs./unit	
630	300	22		B32633A6223+***	550	750	1000
		33		B32633A6333+***	500	700	500
		47	$8.0\times17.0\times27.5$	B32633A6473+***	450	600	500
		68	$9.5\times17.5\times27.5$	B32633A6683+***	350	500	500
		100	$11.5\times19.5\times27.5$	B32633A6104+***	300	400	250
1250	450	10	$7.0\times15.0\times27.5$	B32633A7103+***	500	700	500
		15	$8.0\times16.0\times27.5$	B32633A7153+***	450	600	500
		22	$10.0\times17.5\times27.5$	B32633A7223+***	350	500	500
		33	$12.0\times19.5\times27.5$	B32633A7333+***	300	400	250
		47	$14.0\times21.0\times27.5$	B32633A7473+***	250	350	250
1600	450	3.3	$7.0 \times 13.0 \times 27.5$	B32633A1332+***	500	700	1000
		4.7	$7.0\times13.0\times27.5$	B32633A1472+***	500	700	1000
		6.8	$7.0\times16.0\times27.5$	B32633A1682+***	500	700	500
		10	$8.0 \times 17.0 \times 27.5$	B32633A1103+***	450	650	500
		15	$9.5 \times 17.5 \times 27.5$	B32633A1153+***	350	500	250
		22	$11.5 \times 19.5 \times 27.5$	B32633A1223+***	300	400	250
		33	$15.5\times22.5\times27.5$	B32633A1333+***	250	300	250
2000	500	2.2	$7.0 \times 14.0 \times 27.5$	B32633A2222+***	500	700	1000
		3.3	$7.0 \times 14.0 \times 27.5$	B32633A2332+***	500	700	1000
		4.7	$7.0 \times 15.5 \times 27.5$	B32633A2472+***	500	700	500
		6.8	$9.0 \times 16.5 \times 27.5$	B32633A2682+***	400	550	500
		10	$10.5 \times 17.5 \times 27.5$	B32633A2103+***	350	450	250
		15	$13.0 \times 20.5 \times 27.5$	B32633A2153+***	250	350	250
		22	$15.5\times22.5\times27.5$	B32633A2223+***	200	300	250

Further E series and intermediate capacitance values on request.

## Composition of ordering code

\*\*\* = Packaging code: + = Capacitance tolerance code: K = ±10% 289 = Ammo pack J = ±5% 189 = Reel

±3.5% 010 =Untaped crimped (lead length 6 -1 mm) ±2.5% 011 = Untaped crimped (lead length min. 20 mm) on request = 008 = Untaped (straight, lead length 17±3 mm)

020 = Double crimped (lead length 6 - 1 mm)

Lead configuration (lead length 6 -1 mm)	Reduced	Reduced	Reduced	Enlarged
Lead spacing (mm)	15 mm	17.5 mm	20 mm	25 mm
Packaging code	055	060	070	080



## High pulse (wound)



### Ordering codes and packing units (lead spacing 22.5 mm)

$V_R$	$V_{rms}$	C <sub>R</sub>	Max. dimensions	Ordering code	Ammo	Reel	Untaped
	f≤1 kHz		$w \times h \times I$	(composition see	pack		
VDC	VAC	nF	mm	below)	pcs./unit	pcs./unit	pcs./unit
2500	750	1.0	$7.5\times14.0\times27.5$	B32633A3102+***	450	650	1000
		1.5	$7.5\times15.0\times27.5$	B32633A3152+***	450	650	1000
		2.2	$8.0\times16.0\times27.5$	B32633A3222+***	450	600	500
		3.3	$9.5\times16.0\times27.5$	B32633A3332+***	350	500	500
		4.7	$10.0\times18.5\times27.5$	B32633A3472+***	350	500	500
		6.8	$12.0\times20.5\times27.5$	B32633A3682+***	300	400	250
		10	$14.0\times23.0\times27.5$	B32633A3103+***	250	350	250
		15	$17.0\times26.0\times27.5$	B32633A3153+***	200	300	200
3000	800	1.0	$5.5 \times 12.0 \times 27.5$	B32633S4102+***	650	900	500
		1.5	$6.5\times12.5\times27.5$	B32633S4152+***	550	750	500
		2.2	$7.5\times14.0\times27.5$	B32633S4222+***	450	650	500
		3.3	$9.0\times15.5\times27.5$	B32633S4332+***	400	550	500
		4.7	$11.0\times17.0\times27.5$	B32633S4472+***	300	450	500
		6.8	$13.0\times19.0\times27.5$	B32633S4682+***	250	350	200

Further E series and intermediate capacitance values on request.

### Composition of ordering code

 $A = \pm 3.5\% \\ \text{on request} = \pm 2.5\% \\ \text{on 2} = \pm 2.5\% \\ \text{on 3} = \text{Untaped crimped (lead length 6 - 1 mm)} \\ \text{on 3} = \text{Untaped crimped (lead length min. 20 mm)} \\ \text{on 3} = \text{Untaped (straight, lead length 17<math>\pm$ 3 mm)}

020 = Double crimped (lead length 6 - 1 mm)

Lead configuration (lead length 6 -1 mm)	Reduced	Reduced	Reduced	Enlarged
Lead spacing (mm)	15 mm	17.5 mm	20 mm	25 mm
Packaging code	055	060	070	080





### High pulse (wound)

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

$\overline{V_R}$	$V_{rms}$	C <sub>R</sub>	Max. dimensions	Ordering code	Untaped
	f≤1 kHz		$w \times h \times I$	(composition see	
VDC	VAC	nF	mm	below)	pcs./unit
630	300	100	$9.5 \times 18.0 \times 32.5$	B32634A6104+***	250
		150	$12.0\times22.0\times32.5$	B32634A6154+***	200
		220	$13.5\times22.5\times32.5$	B32634A6224+***	200
		330	$16.0\times25.5\times32.5$	B32634A6334+***	150
1250	450	33	$9.5 \times 18.0 \times 32.5$	B32634A7333+***	250
		47	$11.5\times20.0\times32.5$	B32634A7473+***	250
		68	$13.0\times23.0\times32.5$	B32634A7683+***	200
		100	$16.0\times26.0\times32.5$	B32634A7104+***	150
1600	450	15	$8.5 \times 17.0 \times 32.5$	B32634A1153+***	500
		22	$10.0\times18.5\times32.5$	B32634A1223+***	250
		33	$12.0\times22.0\times32.5$	B32634A1333+***	250
		47	$14.0\times22.5\times32.5$	B32634A1473+***	200
		68	$16.0\times25.5\times32.5$	B32634A1683+***	150
2000	500	10	$8.5 \times 17.0 \times 32.5$	B32634A2103+***	500
		15	$10.0\times20.0\times32.5$	B32634A2153+***	250
		22	$12.0\times22.0\times32.5$	B32634A2223+***	250
		33	$15.0\times25.0\times32.5$	B32634A2333+***	200

Further E series and intermediate capacitance values on request.

#### Composition of ordering code

+ =	Capacitance tolerance code:	*** = Packaging code:

Lead configuration (lead length 6 −1 mm)	Reduced
Lead spacing (mm)	25 mm
Packaging code	090







## High pulse (wound)

### Technical data

Operating temperature range	Max. operating temperature T <sub>op,max</sub> +110 °C		
	Upper category temperature $T_{\text{max}}$		+100 °C
	Lower category temperature T <sub>min</sub>		−55 °C
	Rated tempe	rature T <sub>R</sub>	+85 °C
Dissipation factor tan δ	1.0 · 10 <sup>-3</sup> (at	10 kHz)	
at 20 °C	2.0 · 10-3 (at	100 kHz)	
(upper limit values)			
Insulation resistance R <sub>ins</sub>	100 GΩ		
at 20 °C, rel. humidity ≤ 65%			
(minimum as-delivered values)			
DC test voltage	2.0 · V <sub>R</sub> , 2 s		
Category voltage V <sub>C</sub>	T <sub>A</sub> (°C)	DC voltage derating	AC voltage derating
(continuous operation with $V_{\mbox{\scriptsize DC}}$	$T_A \le 85$	$V_C = V_R$	$V_{C,rms} = V_{rms}$
or $V_{AC}$ at $f \le 1 \text{ kHz}$ )	85 <t<sub>A≤100</t<sub>	$V_{C} = V_{R} \cdot (165 - T_{A})/80$	$V_{C,rms} = V_{rms} \cdot (165 - T_A)/80$
Operating voltage V <sub>op</sub> for	T <sub>A</sub> (°C)	DC voltage (max. hours)	AC voltage (max. hours)
short operating periods	$T_A \le 85$	$V_{op} = 1.25 \cdot V_{C} (2000h)$	$V_{op} = 1.0 \cdot V_{C,rms} (2000h)$
$(V_{DC} \text{ or } V_{AC} \text{ at } f \leq 1 \text{ kHz})$	85 <t<sub>A≤100</t<sub>	$V_{op} = 1.25 \cdot V_{C} (1000h)$	$V_{op} = 1.0 \cdot V_{C,rms} (1000h)$
Damp heat test	56 days/40 °	C/93% relative humidity	
Limit values after damp	Capacitance	change  ∆C/C	≤ 2%
heat test	Dissipation fa	actor change $\Delta$ tan $\delta$	$\leq 1.0 \cdot 10^{-3} \text{ (at 10 kHz)}$
	Inculation ro	oiotopoo D	≥ 50% of minimum
	Insulation res	sistance h <sub>ins</sub>	as-delivered values
Reliability:			
Failure rate $\lambda$	2 fit (≤ 2 · 10	<sup>-9</sup> /h) at 0.5 · V <sub>R</sub> , 40 °C	
Service life t <sub>SL</sub>	200 000 h at	1.0 ⋅ V <sub>R</sub> , 40 °C	
	For conversion to other operating conditions and temperatures,		
	refer to chap	ter "Quality assurance", p	age .
Failure criteria:			
Total failure	Short circuit or open circuit		
Failure due to variation	Capacitance change $ \Delta C/C $ > 10%		> 10%
of parameters	Dissipation factor tan $\delta$ > 4 · upper limit value		> 4 · upper limit value
	Insulation res	sistance R <sub>ins</sub>	< 1500 MΩ





## High pulse (wound)

## Characteristic voltages $\mathbf{V}_{\mathrm{DC}},\,\mathbf{V}_{\mathrm{AC}},\,\mathbf{V}_{\mathrm{pp}}$

V <sub>DC</sub>	V <sub>AC</sub>	V <sub>pp</sub>
630	300	560
1250	450	1000
1600	450	1200
2000	500	1400
2500	750	1750
3000	800	1800



## High pulse (wound)



### Pulse handling capability

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

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

#### Note:

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

### dV/dt values

Lead spacing		15 mm	22.5 mm	27.5 mm
V <sub>R</sub> VDC	V <sub>rms</sub> VAC	dV/dt in V/μs		
630	300	5 000	3 000	2 000
1250	450	12 000	7 000	4 500
1600	450	14 000	9 000	5 500
2000	500	17 000	12 000	7 000
2500	750	-	14 000	-
3000	800	18 000	15 000	-

### k<sub>o</sub> values

Lead spacing		15 mm	22.5 mm	27.5 mm
$\overline{V_R}$	$V_{rms}$			
VDC	VAC	$k_0$ in $V^2/\mu s$		
630	300	6 300 000	3 800 000	2 500 000
1250	450	30 000 000	17 500 000	11 000 000
1600	450	45 000 000	29 000 000	17 500 000
2000	500	68 000 000	48 000 000	28 000 000
2500	750	-	59 000 000	-
3000	800	108 000 000	90 000 000	_

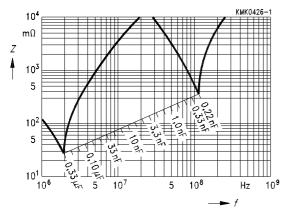




High pulse (wound)

## Impedance Z versus frequency f

(typical values)







High pulse (wound)

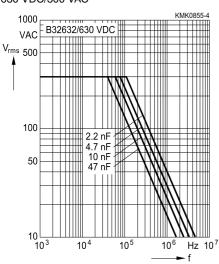


Permissible AC voltage  $V_{rms}$  versus frequency f (for sinusoidal waveforms,  $T_A \leq\! 90~^{\circ}\text{C})$ 

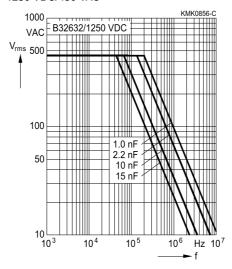
For  $T_A > 90$  °C, please refer to "General technical information", section 3.2.3.

### Lead spacing 15 mm

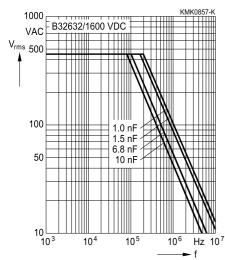
630 VDC/300 VAC



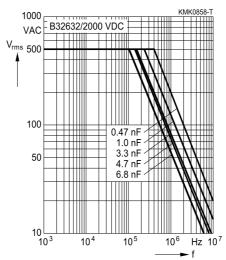
### 1250 VDC/450 VAC



### 1600 VDC/450 VAC



### 2000 VDC/500 VAC







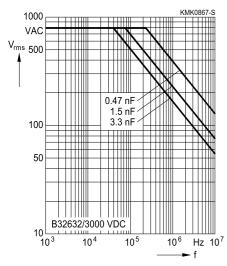
## High pulse (wound)

### Permissible AC voltage $V_{rms}$ versus frequency f (for sinusoidal waveforms, $T_A \leq 90$ °C)

For  $T_A > 90$  °C, please refer to "General technical information", section 3.2.3.

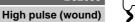
### Lead spacing 15 mm

3000 VDC/800 VAC









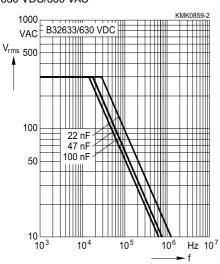


Permissible AC voltage  $V_{rms}$  versus frequency f (for sinusoidal waveforms,  $T_A \le 90$  °C)

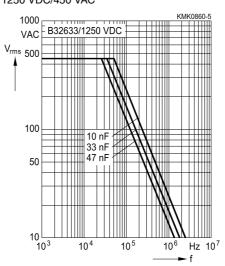
For  $T_A > 90$  °C, please refer to "General technical information", section 3.2.3.

### Lead spacing 22.5 mm

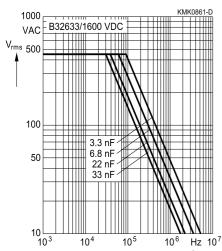
630 VDC/300 VAC



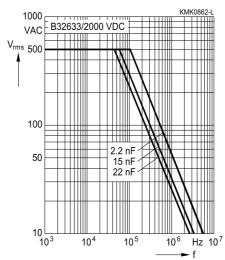
## 1250 VDC/450 VAC



### 1600 VDC/450 VAC



### 2000 VDC/500 VAC







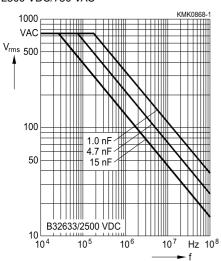
### High pulse (wound)

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

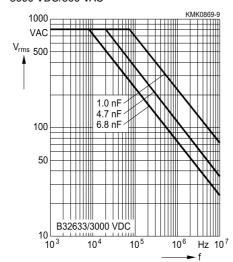
For T  $_{\rm A}$  >90  $^{\circ}\text{C},$  please refer to "General technical information", section 3.2.3.

### Lead spacing 22.5 mm

2500 VDC/750 VAC



### 3000 VDC/800 VAC





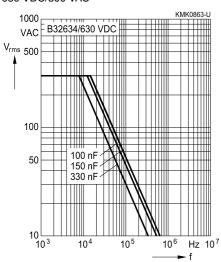


High pulse (wound)

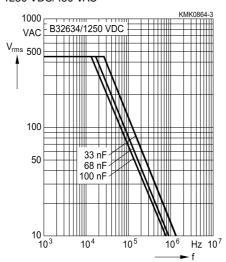
Permissible AC voltage  $V_{rms}$  versus frequency f (for sinusoidal waveforms,  $T_A \le 90$  °C) For  $T_A > 90$  °C, please refer to "General technical information", section 3.2.3.

### Lead spacing 27.5 mm

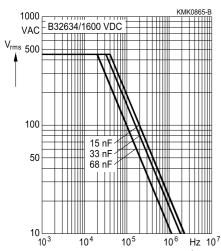
630 VDC/300 VAC



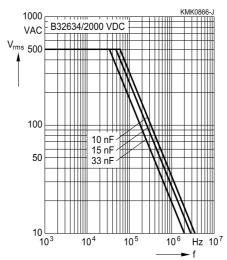
### 1250 VDC/450 VAC



### 1600 VDC/450 VAC



### 2000 VDC/500 VAC





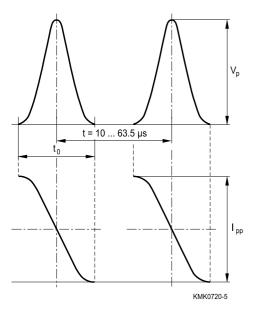


High pulse (wound)

### Flyback application

## Permissible voltage and current / waveform

Permissible current  $I_{pp}$  versus frequency for a duty cycle of 20% ( $t_0/t = 0.2$ ):



Approximation formular for duty cycle higher than 20%:

$$I'_{pp} = I_{pp} \cdot \sqrt{\frac{t_0^3}{t_0'^3}}$$

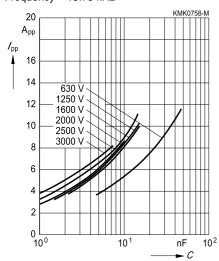


## High pulse (wound)

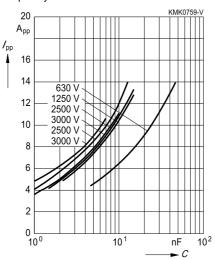


### Flyback application Permissible current $I_{pp}$ versus rated capacitance $C_{\text{R}}$

Frequency = 15.75 kHz



Frequency = 31.5 kHz



Frequency = 95 kHz

