

## Long-life grade capacitors

### Applications

- Professional switch-mode power supplies in industrial electronics and in data processing equipment
- Switch-mode power supplies in entertainment electronics
- Frequency converters

### Features

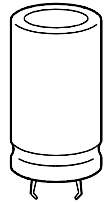
- High reliability
- High CU product, extremely compact
- Low equivalent series resistance *ESR*
- Many different case sizes available for each capacitance value

### Construction

- Charge-discharge proof, polar
- Aluminum case, fully insulated
- Snap-in solder pins to hold component in place on PC-board
- Minus pole marking on case surface
- Minus pole not insulated from case
- Overload protection (safety vent)

### Terminals

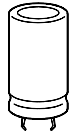
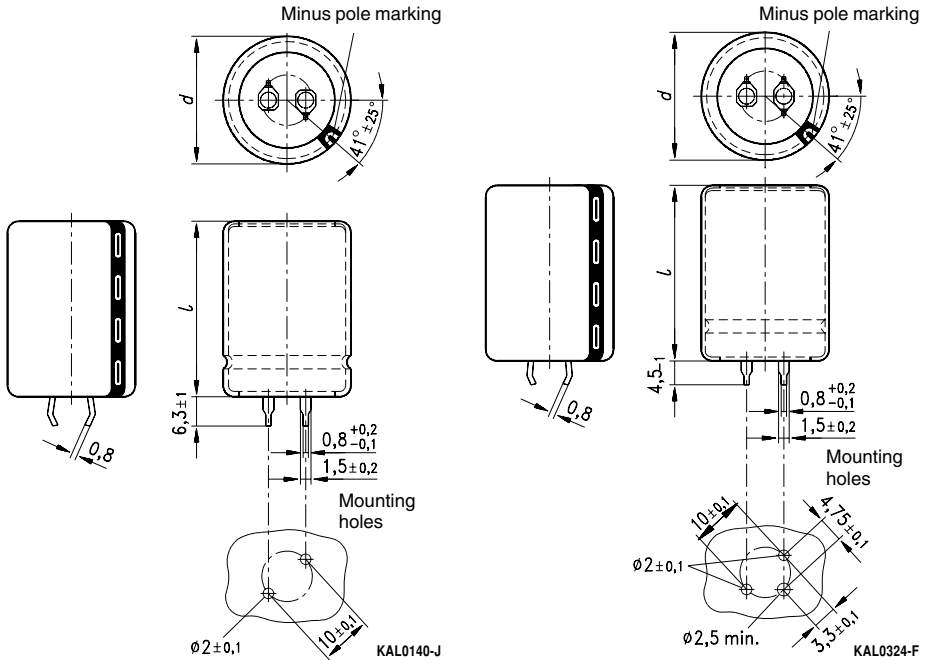
- Standard version with 2 terminals  
2 lengths available: 6,3 and 4,5 mm
- 3 terminals: length 4,5 mm  
(terminal arrangement ensures correct insertion)



KAL0274-A


**Specifications and characteristics in brief**

Rated voltage $U_R$	200 ... 450 VDC	
Surge voltage $U_S$	$1,15 \cdot U_R$ (for $U_R \leq 250$ VDC) $1,10 \cdot U_R$ (for $U_R \geq 400$ VDC)	
Rated capacitance $C_R$	47 ... 2 200 $\mu\text{F}$	
Capacitance tolerance	$\pm 20 \% \triangleq \text{M}$	
Dissipation factor $\tan \delta$ (20 °C, 120 Hz)	$U_R \leq 400$ VDC: $\tan \delta \leq 0,15$ $U_R \geq 420$ VDC: $\tan \delta \leq 0,20$	
Leakage current $I_L$ (5 min, 20 °C)	$I_L \leq 0,3 \mu\text{A} \cdot \left( \frac{C_R}{\mu\text{F}} \cdot \frac{U_R}{\text{V}} \right)^{0,7} + 4 \mu\text{A}$	
Self-inductance $ESL$	Approx. 20 nH	
Useful life 105 °C; $U_R$ ; $I_{-R}$ 85 °C; $U_R$ ; $I_{-max}$ 40 °C; $U_R$ ; $1,9 \cdot I_{-R}$	$> 3\ 000$ h $> 6\ 500$ h $> 200\ 000$ h	<b>Requirements:</b> $\Delta C/C \leq \pm 30\ %$ of initial value $\tan \delta \leq 3$ times initial specified limit $I_L \leq$ initial specified limit Failure percentage: $\leq 1\ %$ Failure rate: $\leq 40$ fit ( $\leq 40 \cdot 10^{-9}/\text{h}$ ) (for definition "fit", refer to chapter "Quality", page 62)
Load life test 105 °C; $U_R$ ; $I_{-R}$	2 000 h	<b>Post test requirements:</b> $\Delta C/C \leq \pm 20\ %$ of initial value $\tan \delta \leq 2$ times initial specified limit $I_L \leq$ initial specified limit
Voltage endurance test 105 °C; $U_R$	2 000 h	<b>Post test requirements:</b> $\Delta C/C \leq \pm 10\ %$ of initial value $\tan \delta \leq 1,3$ times specified limit $I_L \leq$ initial specified limit
Vibration resistance	To IEC 60068-2-6, test Fc: displacement amplitude 0,35 mm, frequency range 10 ... 55 Hz, acceleration max. 5 g, duration $3 \times 2$ h	
IEC climatic category	To IEC 60068-1: $U_R \leq 400$ VDC: 40/105/56 (– 40 °C/+ 105 °C/56 days damp heat test) $U_R \geq 420$ VDC: 25/105/56 (– 25 °C/+ 105 °C/56 days damp heat test)	
Detail specification	Similar to CECC 30301-809	
Sectional specification	IEC 60384-4	


**Dimensional drawings**


Snap-in terminals, standard (length  $6,3 \pm 1$  mm). Also available in a shorter version with a length of  $4,5 - 1$  mm. For packing mode and ordering example see next page.

Snap-in capacitors are also available with 3 terminals (length  $4,5 - 1$  mm). For packing mode and ordering example see next page.

Dimensions (mm)		Approx. weight (g)	Packing units (pieces)
$d + 1$	$l \pm 2$		
22	25	9	160
22	30	12	160
22	35	15	160
22	40	18	160
22	50	24	160
<hr/>			
25	25	13	130
25	30	17	130
25	35	19	130
25	40	22	130
25	45	26	130
25	50	30	130

Dimensions (mm)		Approx. weight (g)	Packing units (pieces)
$d + 1$	$l \pm 2$		
30	25	17	80
30	30	23	80
30	35	29	80
30	40	36	80
30	45	41	80
30	50	47	80
<hr/>			
35	25	22	60
35	30	29	60
35	35	36	60
35	40	41	60
35	45	57	60
35	50	72	60



B43504

Compact – 105 °C

### Packing of snap-in capacitors



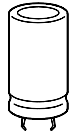
For ecological reasons the packing is pure cardboard. Components can be withdrawn (in full or in part) in the correct position for insertion.

### Ordering codes

Snap-in terminals Version	Identification in 3rd block of ordering code
Standard terminals (6,3 ± 1) mm	M000
Short terminals (4,5 – 1) mm	M007
3 terminals (4,5 – 1) mm	M002

Ordering example:

B43504A9107M007 } snap-in capacitor with short terminals  
B43504A9107M002 } snap-in capacitor with 3 terminals


**Overview of available types**

$U_R$ (VDC)	200	250	400	420	450
$C_R$ ( $\mu$ F)	Case dimensions $d \times l$ (mm)				
47			22 × 25		
68			22 × 25		22 × 30
82			22 × 30	22 × 30	22 × 35
100			22 × 35 25 × 25	22 × 35 25 × 30	22 × 35 25 × 30 30 × 25
120			22 × 35	22 × 40 25 × 30	25 × 35
150			22 × 40 30 × 25	25 × 35 30 × 30	25 × 40 30 × 30 35 × 25
180			25 × 40 30 × 30	25 × 40 30 × 30	25 × 45
220	22 × 25	22 × 30	25 × 45 30 × 35 35 × 30	25 × 45 30 × 35	25 × 50 30 × 40 35 × 30
270	22 × 25	22 × 35	25 × 50	30 × 40	30 × 45 35 × 35
330	22 × 30	22 × 40 25 × 30	30 × 45 35 × 35	30 × 45 35 × 35	30 × 50 35 × 40
390	22 × 30	25 × 35	30 × 50	30 × 50 35 × 40	35 × 45
470	22 × 35 30 × 25	22 × 50 30 × 30	35 × 45	35 × 45	35 × 50
560	25 × 35	25 × 45	35 × 50		
680	25 × 40 35 × 25	25 × 50 30 × 40			
820	25 × 45 35 × 30	30 × 45			
1 000	30 × 35	35 × 40			
1 200	30 × 40	35 × 45			
1 500	35 × 40				
1 800	35 × 45				
2 200	35 × 50				

The capacitance and voltage ratings listed above are available in different cases upon request. Other voltage and capacitance ratings are also available upon request.


**Technical data and ordering codes**

$U_R$	$C_R$ 100 Hz 20 °C μF	Case dimensions $d \times l$ mm	$ESR_{typ}$ 100 Hz 20 °C mΩ	$Z_{max}$ 10 kHz 20 °C mΩ	$I_{\sim max}$ 100 Hz 40 °C A	$I_{\sim max}$ 100 Hz 85 °C A	$I_{\sim R}^{(1)}$ 100 Hz 105 °C A	Ordering code <sup>2)</sup>
200	220	22 × 25	580	700	2,6	1,7	0,84	B43504E2227M000
	270	22 × 25	480	570	2,8	1,9	0,93	B43504E2277M000
	330	22 × 30	390	470	3,3	2,2	1,1	B43504A2337M000
	390	22 × 30	330	400	3,6	2,4	1,2	B43504E2397M000
	470	22 × 35	280	330	4,2	2,8	1,4	B43504E2477M000
	470	30 × 25	280	330	4,5	3,0	1,5	B43504F2477M000
	560	25 × 35	230	280	5,0	3,4	1,6	B43504E2567M000
	680	25 × 40	190	230	5,8	3,9	1,9	B43504E2687M000
	680	35 × 25	190	230	6,0	4,0	2,0	B43504F2687M000
	820	25 × 45	160	190	6,6	4,5	2,2	B43504E2827M000
	820	35 × 30	160	190	6,9	4,7	2,3	B43504A2827M000
	1 000	30 × 35	130	160	7,3	4,9	2,4	B43504E2108M000
	1 200	30 × 40	110	130	8,4	5,6	2,7	B43504E2128M000
	1 500	35 × 40	90	110	10	6,9	3,4	B43504E2158M000
	1 800	35 × 45	80	90	12	7,9	3,9	B43504E2188M000
	2 200	35 × 50	60	70	14	9,1	4,4	B43504E2228M000
250	220	22 × 30	580	700	2,7	1,8	0,89	B43504A2227M000
	270	22 × 35	480	570	3,2	2,2	1,1	B43504A2277M000
	330	22 × 40	390	470	3,7	2,5	1,2	B43504B2337M000
	330	25 × 30	390	470	3,6	2,4	1,2	B43504C2337M000
	390	25 × 35	330	400	4,2	2,8	1,4	B43504A2397M000
	470	22 × 50	280	330	4,9	3,3	1,6	B43504A2477M000
	470	30 × 30	280	330	4,7	3,2	1,6	B43504B2477M000
	560	25 × 45	230	280	5,5	3,7	1,8	B43504A2567M000
	680	25 × 50	190	230	6,3	4,2	2,1	B43504A2687M000
	680	30 × 40	190	230	6,3	4,2	2,1	B43504B2687M000
	820	30 × 45	160	190	7,2	4,9	2,4	B43504B2827M000
	1 000	35 × 40	130	160	8,4	5,7	2,8	B43504A2108M000
	1 200	35 × 45	110	130	9,6	6,5	3,2	B43504A2128M000

Preferred types

1) 120 Hz conversion factor of ripple current:  $I_{\sim}(120\text{ Hz}) = 1,03 \cdot I_{\sim}(100\text{ Hz})$

2) Ordering code for standard terminals (6,3 mm).

To determine the ordering code for short terminals (4,5 mm) and 3 terminals (4,5 mm) see page 248.



$U_R$	$C_R$ 100 Hz 20 °C $\mu\text{F}$	Case dimensions $d \times l$ mm	$ESR_{\text{typ}}$ 100 Hz 20 °C m $\Omega$	$Z_{\text{max}}$ 10 kHz 20 °C m $\Omega$	$I_{\text{max}}$ 100 Hz 40 °C A	$I_{\text{max}}$ 100 Hz 85 °C A	$I_{\text{R}}^{(1)}$ 100 Hz 105 °C A	Ordering code <sup>2)</sup>
400	47	22 × 25	1870	2310	1,2	0,79	0,39	B43504A9476M000
	68	22 × 25	1290	1600	1,4	0,95	0,47	B43504A9686M000
	82	22 × 30	1070	1320	1,7	1,1	0,55	B43504A9826M000
	100	22 × 35	880	1090	2,0	1,3	0,64	B43504A9107M000
	100	25 × 25	880	1090	1,9	1,3	0,61	B43504B9107M000
	120	22 × 35	730	910	2,1	1,4	0,70	B43504A9127M000
	150	22 × 40	590	730	2,5	1,7	0,82	B43504A9157M000
	150	30 × 25	590	730	2,5	1,7	0,83	B43504B9157M000
	180	25 × 40	490	610	3,0	2,0	0,98	B43504A9187M000
	180	30 × 30	490	610	2,9	2,0	0,96	B43504B9187M000
	220	25 × 45	400	500	3,4	2,3	1,1	B43504A9227M000
	220	30 × 35	400	500	3,4	2,3	1,1	B43504B9227M000
	220	35 × 30	400	500	3,6	2,4	1,2	B43504C9227M000
	270	25 × 50	330	410	4,0	2,7	1,3	B43504A9277M000
	330	30 × 45	270	330	4,6	3,1	1,5	B43504A9337M000
	330	35 × 35	270	330	4,6	3,1	1,5	B43504B9337M000
390	30 × 50	230	280	5,2	3,5	1,7	B43504A9397M000	
470	35 × 45	190	240	6,0	4,1	2,0	B43504A9477M000	
560	35 × 50	160	200	6,8	4,6	2,2	B43504A9567M000	
420	82	22 × 30	1650	1950	1,66	1,12	0,55	B43504A0826M000
	100	22 × 35	1360	1600	1,95	1,31	0,64	B43504A0107M000
	100	25 × 30	1360	1600	2,00	1,34	0,65	B43504E0107M000
	120	22 × 40	1130	1330	2,25	1,51	0,74	B43504A0127M000
	120	25 × 30	1130	1330	2,19	1,47	0,72	B43504E0127M000
	150	25 × 35	910	1070	2,58	1,74	0,85	B43504A0157M000
	150	30 × 30	910	1070	2,67	1,80	0,88	B43504E0157M000
	180	25 × 40	760	890	2,97	2,00	0,98	B43504A0187M000
	180	30 × 30	760	890	2,93	1,97	0,96	B43504E0187M000

Preferred types

1) 120 Hz conversion factor of ripple current:  $I_{\text{R}}(120 \text{ Hz}) = 1,03 \cdot I_{\text{R}}(100 \text{ Hz})$

2) Ordering code for standard terminals (6,3 mm).

To determine the ordering code for short terminals (4,5 mm) and 3 terminals (4,5 mm) see page 248.



$U_R$	$C_R$ 100 Hz 20 °C $\mu\text{F}$	Case dimensions $d \times l$ mm	$ESR_{\text{typ}}$ 100 Hz 20 °C $\text{m}\Omega$	$Z_{\text{max}}$ 10 kHz 20 °C $\text{m}\Omega$	$I_{\sim\text{max}}$ 100 Hz 40 °C A	$I_{\sim\text{max}}$ 100 Hz 85 °C A	$I_{\sim R^1}$ 100 Hz 105 °C A	Ordering code <sup>2)</sup>	
VDC	420	220	25 × 45	620	730	3,44	2,31	1,13	B43504A0227M000
		220	30 × 35	620	730	3,41	2,29	1,12	B43504E0227M000
		270	30 × 40	510	590	3,96	2,66	1,30	B43504A0277M000
		330	30 × 45	410	490	4,58	3,08	1,50	B43504A0337M000
		330	35 × 35	410	490	4,62	3,11	1,52	B43504E0337M000
		390	30 × 50	350	410	5,18	3,48	1,70	B43504A0397M000
		390	35 × 40	350	410	5,26	3,54	1,72	B43504E0397M000
		470	35 × 45	290	340	6,02	4,05	1,97	B43504A0477M000
VDC	450	68	22 × 30	1990	2350	1,5	1,0	0,50	B43504A5686M000
		82	22 × 35	1650	1950	1,8	1,2	0,58	B43504A5826M000
		100	22 × 35	1360	1600	2,0	1,3	0,64	B43504A5107M000
		100	25 × 30	1360	1600	2,0	1,3	0,65	B43504B5107M000
		100	30 × 25	1360	1600	2,1	1,4	0,67	B43504C5107M000
		120	25 × 35	1130	1330	2,3	1,6	0,76	B43504A5127M000
		150	25 × 40	910	1070	2,7	1,8	0,89	B43504A5157M000
		150	30 × 30	910	1070	2,7	1,8	0,88	B43504B5157M000
		150	35 × 25	910	1070	2,8	1,9	0,92	B43504C5157M000
		180	25 × 45	760	890	3,1	2,1	1,0	B43504A5187M000
		220	25 × 50	620	730	3,6	2,4	1,2	B43504A5227M000
		220	30 × 40	620	730	3,6	2,4	1,2	B43504B5227M000
		220	35 × 30	620	730	3,6	2,4	1,2	B43504C5227M000
		270	30 × 45	510	590	4,1	2,8	1,4	B43504A5277M000
		270	35 × 35	510	590	4,1	2,8	1,4	B43504B5277M000
		330	30 × 50	410	490	4,8	3,2	1,6	B43504A5337M000
		330	35 × 40	410	490	4,8	3,3	1,6	B43504B5337M000
		390	35 × 45	350	410	5,5	3,7	1,8	B43504A5397M000
		470	35 × 50	290	340	6,3	4,2	2,1	B43504A5477M000

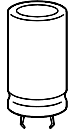
Preferred types

1) 120 Hz conversion factor of ripple current:  $I_{\sim}(120\text{ Hz}) = 1,03 \cdot I_{\sim}(100\text{ Hz})$

2) Ordering code for standard terminals (6,3 mm).

To determine the ordering code for short terminals (4,5 mm) and 3 terminals (4,5 mm) see page 248.



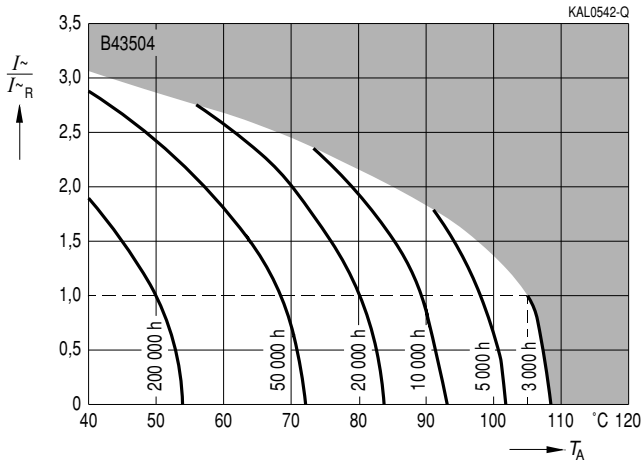


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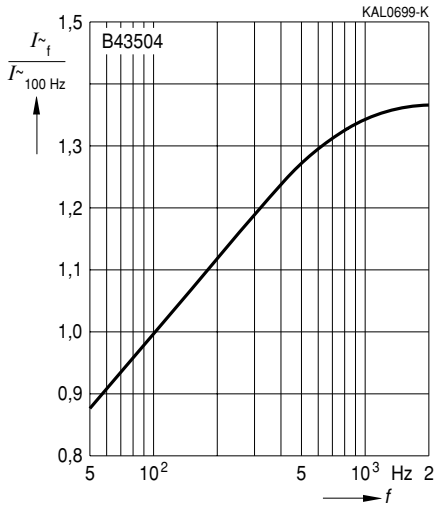
Compact – 105 °C

### Useful life

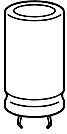
depending on ambient temperature  $T_A$  under ripple current operating conditions<sup>1)</sup>



### Frequency factor of permissible ripple current $I_{\sim}$ versus frequency $f$



1) Refer to page 40 for an explanation on how to interpret the useful life graphs.

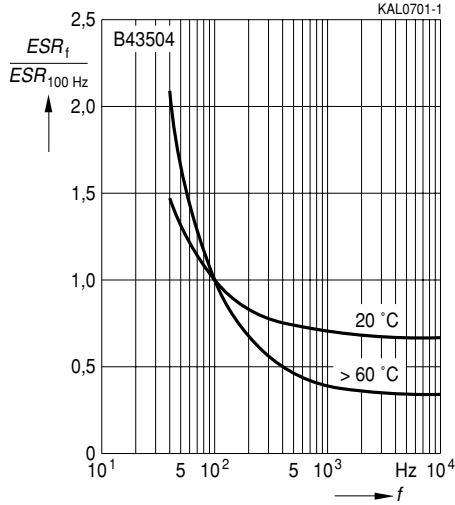


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**Compact – 105 °C**

**Frequency characteristics of ESR**

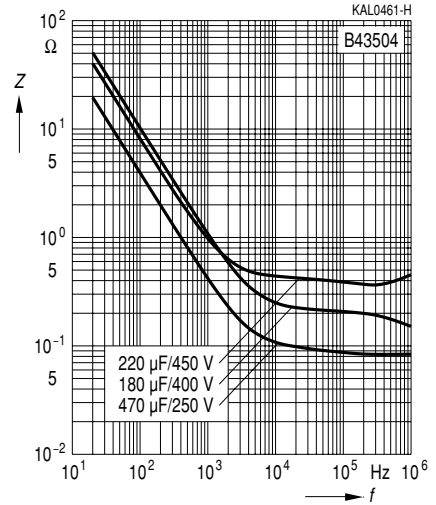
Typical behavior



**Impedance Z**

versus frequency  $f$

Typical behavior at 20 °C



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