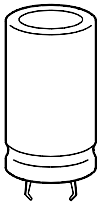
LL grade
For professional switch-mode power supplies



KAL0274-A

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
- All-welded construction

Terminals

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

Features

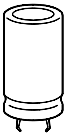
- High reliability
- High CU product, i. e. extremely compact
- Low equivalent series resistance R_{ESR}
- Many different case sizes available for each capacitance value

Applications

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

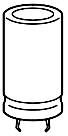
Specifications and characteristics in brief

Rated voltage U_R	200 … 450 V–
Surge voltage U_S	1,15 · U_R (for $U_R \leq$ 250 V–) 1,10 · U_R (for $U_R \geq$ 400 V–)
Rated capacitance C_R	47 … 2 200 µF
Capacitance tolerance	± 20 % ≙ M
Useful life	
40 ℃, U_R	> 200 000 h (1,9 · $I_{\sim R,105°C}$)
85 ℃, U_R; $I_{\sim max}$	> 6 500 h
105 ℃, U_R; $I_{\sim R}$	> 3 000 h
Failure percentage	≤ 1 % (during useful life)
Failure rate	≤ 40 fit (≤ 40 · 10^{-9}/h)

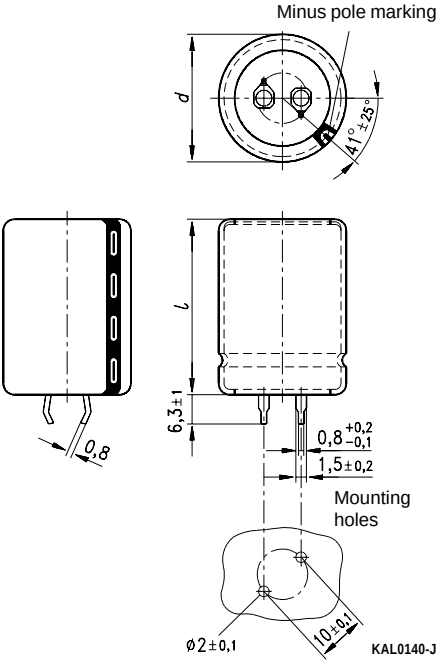


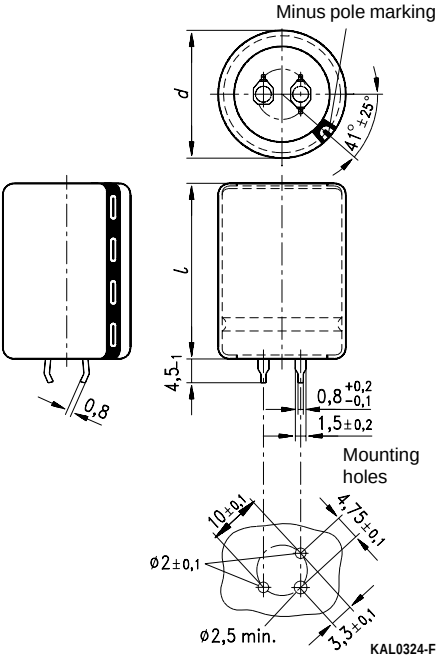
Specifications and characteristics in brief

Load life	2 000 h (at 105 °C, U_R, $I_{\sim R}$) Post test requirements: Capacitance change $\Delta C/C$ $\leq \pm$ 20 % of initial value Dissipation factor tan δ $\leq$ 200 % of specified value Leakage current I_{lka} $\leq$ the initial specified value
Dissipation factor tan δ (20 °C, 120 Hz)	tan $\delta \leq$ 0,15 for $U_R \leq$ 400 V– tan $\delta \leq$ 0,20 for U_R = 450 V–
Leakage current I_{lka} (5 min, 20 °C)	$I_{lka} \leq 0{,}3\ \mu A \cdot \left(\frac{C_R}{\mu F} \cdot \frac{U_R}{V}\right)^{0,7} + 4\ \mu A$
Self-inductance L_{ESL}	approx. 20 nH
IEC climatic category	in accordance with IEC 68–1 $\leq$ 400 V–: 40/105/56 (–40 °C/+105 °C, 56 days damp heat test) 450 V–: 25/105/56 (–25 °C/+105 °C, 56 days damp heat test)
Detail specification	similar to CECC 30 301-809
Sectional specification	IEC 384–4
Vibration resistance	in accordance with IEC 68–2–6, test Fc: displacement amplitude 0,35 mm, frequency range 10 … 55 Hz, acceleration max. 5 *g*, duration 3 $\times$ 2 h



Dimensional drawings



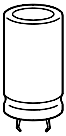


Snap-in terminals, standard (length 6,3 ± 1 mm). Also available in a shorter version with a length of 4,5 – 1 mm. For packing mode and ordering example see page 247.

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

Snap-in capacitors are also available with 3 terminals.
For packing mode and ordering example see page 247.

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



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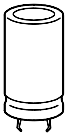
Overview of available types

U_R (V–)	200	250	400	450
C_R (µF)	Case dimensions $d \times l$ (mm)			
47			22 × 25	
68			22 × 25	22 × 30
82			22 × 30	22 × 35
100			22 × 35 25 × 25	22 × 35 25 × 30 30 × 25
120			22 × 35	25 × 35
150			22 × 40 30 × 25	25 × 40 30 × 30 35 × 25
180			25 × 40 30 × 30	25 × 45
220	22 × 25	22 × 30	25 × 45 30 × 35 35 × 30	25 × 50 30 × 40 35 × 30
270	22 × 25	22 × 35	25 × 50	30 × 45 35 × 35
330	22 × 30	22 × 40 25 × 30	30 × 45 35 × 35	30 × 50 35 × 40
390	22 × 30	25 × 35	30 × 50	35 × 45
470	22 × 35 30 × 25	22 × 50 30 × 30	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			

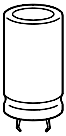
The capacitance and voltage ratings listed above are available in different cases upon request. Other voltage and capacitance ratings are also available upon request.



Technical data and ordering codes

U_R	C_R	Case dimensions $d \times l$	$R_{ESR,\ typ}$ 100 Hz 20 °C	Z_{max} 10 kHz 20 °C	$I_{\sim max}$ 100 Hz 40 °C	$I_{\sim max}$ 100 Hz 85 °C	$I_{\sim R}$ [1] 100 Hz 105 °C	Ordering code [2]
V–	µF	mm	mΩ	mΩ	A	A	A	Short code
B43504-								
200	220	22 × 25	580	700	2,6	1,7	0,84	-E2227-M
	270	22 × 25	480	570	2,8	1,9	0,93	-E2277-M
	330	22 × 30	390	470	3,3	2,2	1,1	-A2337-M
	390	22 × 30	330	400	3,6	2,4	1,2	-E2397-M
	470	22 × 35	280	330	4,2	2,8	1,4	-E2477-M
	470	30 × 25	280	330	4,5	3,0	1,5	-F2477-M
	560	25 × 35	230	280	5,0	3,4	1,6	-E2567-M
	680	25 × 40	190	230	5,8	3,9	1,9	-E2687-M
	680	35 × 25	190	230	6,0	4,0	2,0	-F2687-M
	820	25 × 45	160	190	6,6	4,5	2,2	-E2827-M
	820	35 × 30	160	190	6,9	4,7	2,3	-A2827-M
	1 000	30 × 35	130	160	7,3	4,9	2,4	-E2108-M
	1 200	30 × 40	110	130	8,4	5,6	2,7	-E2128-M
	1 500	35 × 40	90	110	10	6,9	3,4	-E2158-M
	1 800	35 × 45	80	90	12	7,9	3,9	-E2188-M
	2 200	35 × 50	60	70	14	9,1	4,4	-E2228-M
250	220	22 × 30	580	700	2,7	1,8	0,89	-A2227-M
	270	22 × 35	480	570	3,2	2,2	1,1	-A2277-M
	330	22 × 40	390	470	3,7	2,5	1,2	-B2337-M
	330	25 × 30	390	470	3,6	2,4	1,2	-C2337-M
	390	25 × 35	330	400	4,2	2,8	1,4	-A2397-M
	470	22 × 50	280	330	4,9	3,3	1,6	-A2477-M
	470	30 × 30	280	330	4,7	3,2	1,6	-B2477-M
	560	25 × 45	230	280	5,5	3,7	1,8	-A2567-M
	680	25 × 50	190	230	6,3	4,2	2,1	-A2687-M
	680	30 × 40	190	230	6,3	4,2	2,1	-B2687-M
	820	30 × 45	160	190	7,2	4,9	2,4	-B2827-M
	1 000	35 × 40	130	160	8,4	5,7	2,8	-A2108-M
	1 200	35 × 45	110	130	9,6	6,5	3,2	-A2128-M

1) 120 Hz conversion factor of ripple current: $I\sim$ (120 Hz) = 1,03 · $I\sim$ (100 Hz)
2) To obtain the required ordering code, prefix the type number to the short code. E. g.: B43504-E2227-M



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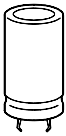
Technical data and ordering codes

U_R	C_R	Case dimensions $d \times l$	$R_{ESR, typ}$ 100 Hz 20 °C	Z_{max} 10 kHz 20 °C	$I_{\sim max}$ 100 Hz 40 °C	$I_{\sim max}$ 100 Hz 85 °C	$I_{\sim R}$ [1] 100 Hz 105 °C	Ordering code [2]
V–	µF	mm	mΩ	mΩ	A	A	A	Short code
B43504-								
400	47	22 × 25	1870	2310	1,2	0,79	0,39	-A9476-M
	68	22 × 25	1290	1600	1,4	0,95	0,47	-A9686-M
	82	22 × 30	1070	1320	1,7	1,1	0,55	-A9826-M
	100	22 × 35	880	1090	2,0	1,3	0,64	-A9107-M
	100	25 × 25	880	1090	1,9	1,3	0,61	-B9107-M
	120	22 × 35	730	910	2,1	1,4	0,70	-A9127-M
	150	22 × 40	590	730	2,5	1,7	0,82	-A9157-M
	150	30 × 25	590	730	2,5	1,7	0,83	-B9157-M
	180	25 × 40	490	610	3,0	2,0	0,98	-A9187-M
	180	30 × 30	490	610	2,9	2,0	0,96	-B9187-M
	220	25 × 45	400	500	3,4	2,3	1,1	-A9227-M
	220	30 × 35	400	500	3,4	2,3	1,1	-B9227-M
	220	35 × 30	400	500	3,6	2,4	1,2	-C9227-M
	270	25 × 50	330	410	4,0	2,7	1,3	-A9277-M
	330	30 × 45	270	330	4,6	3,1	1,5	-A9337-M
	330	35 × 35	270	330	4,6	3,1	1,5	-B9337-M
	390	30 × 50	230	280	5,2	3,5	1,7	-A9397-M
	470	35 × 45	190	240	6,0	4,1	2,0	-A9477-M
	560	35 × 50	160	200	6,8	4,6	2,2	-A9567-M

1) 120 Hz conversion factor of ripple current: $I\sim$ (120 Hz) = 1,03 · $I\sim$ (100 Hz)
2) To obtain the required ordering code, prefix the type number to the short code. E. g.: B43504-A9476-M

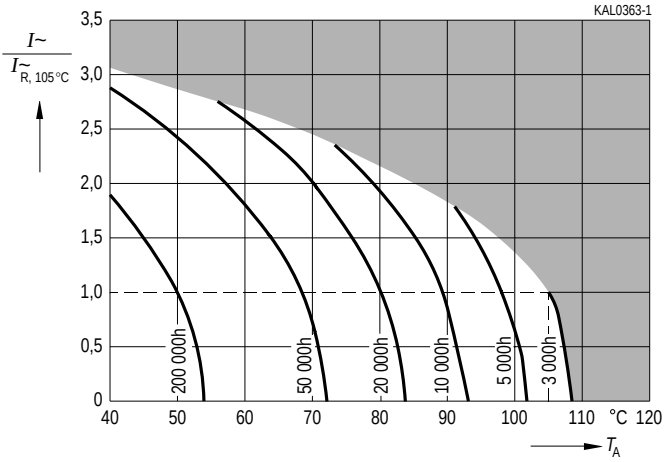


Technical data and ordering codes

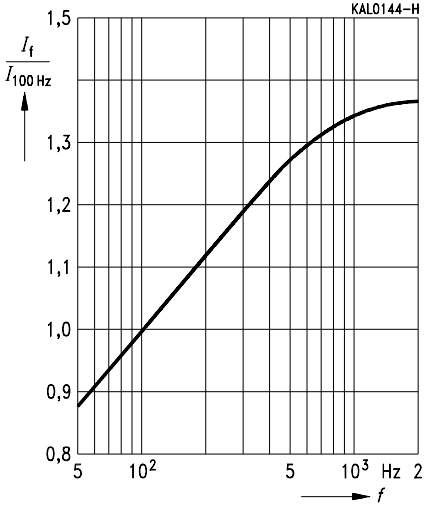
U_R	C_R	Case dimensions $d \times l$	$R_{ESR,\ typ}$ 100 Hz 20 °C	Z_{max} 10 kHz 20 °C	$I_{\sim max}$ 100 Hz 40 °C	$I_{\sim max}$ 100 Hz 85 °C	$I_{\sim R}$ [1] 100 Hz 105 °C	Ordering code [2]
V–	µF	mm	mΩ	mΩ	A	A	A	Short code
B43504-								
450	68	22 × 30	1990	2350	1,5	1,0	0,50	-A5686-M
	82	22 × 35	1650	1950	1,8	1,2	0,58	-A5826-M
	100	22 × 35	1360	1600	2,0	1,3	0,64	-A5107-M
	100	25 × 30	1360	1600	2,0	1,3	0,65	-B5107-M
	100	30 × 25	1360	1600	2,1	1,4	0,67	-C5107-M
	120	25 × 35	1130	1330	2,3	1,6	0,76	-A5127-M
	150	25 × 40	910	1070	2,7	1,8	0,89	-A5157-M
	150	30 × 30	910	1070	2,7	1,8	0,88	-B5157-M
	150	35 × 25	910	1070	2,8	1,9	0,92	-C5157-M
	180	25 × 45	760	890	3,1	2,1	1,0	-A5187-M
	220	25 × 50	620	730	3,6	2,4	1,2	-A5227-M
	220	30 × 40	620	730	3,6	2,4	1,2	-B5227-M
	220	35 × 30	620	730	3,6	2,4	1,2	-C5227-M
	270	30 × 45	510	590	4,1	2,8	1,4	-A5277-M
	270	35 × 35	510	590	4,1	2,8	1,4	-B5277-M
	330	30 × 50	410	490	4,8	3,2	1,6	-A5337-M
	330	35 × 40	410	490	4,8	3,3	1,6	-B5337-M
	390	35 × 45	350	410	5,5	3,7	1,8	-A5397-M
	470	35 × 50	290	340	6,3	4,2	2,1	-A5477-M

1) 120 Hz conversion factor of ripple current: $I\sim$ (120 Hz) = 1,03 · $I\sim$ (100 Hz)
2) To obtain the required ordering code, prefix the type number to the short code. E. g.: B43504-A5686-M

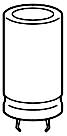
Useful life
versus ambient temperature T_A under ripple current operating conditions [1)]



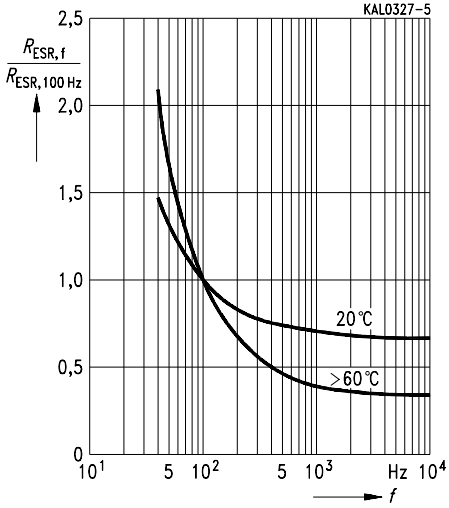
Permissible ripple current *I*~
versus frequency *f*



1) Refer to page 34 for an explanation on how to interpret the useful life graphs.



Equivalent series resistance R_{ESR}
versus frequency f
Typical behavior



Impedance Z
versus frequency f
Typical behavior