Aluminum electrolytic capacitors

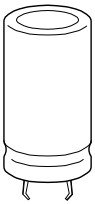
Snap-in capacitors

Series/Type: **B43630**

Date: December 2014

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General-purpose grade capacitors



Applications

- Frequency converters
- Solar inverters
- Uninterruptible power supplies
- Professional power supplies
- Medical appliances
- White goods

Features

- Voltage derating (0.93 · V_R) enables 105 °C operation, more details available upon request
- Extremely high CV product, ultra compact
- High ripple current capability
- Different case sizes available for each capacitance value
- Capacitors with all insulation versions pass the needle flame test according to IEC 60695-11-5 for all flame exposure times up to 120 s
- RoHS-compatible

Construction

- Charge/discharge-proof, polar
- Aluminum case, fully insulated with PVC
- Version with PET insulation available
- Version with additional PET insulation cap on terminal side available for insulating the capacitor from the PCB
- 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 by safety vent on the base

Terminals

- Standard version with 2 terminals, 2 lengths available: 6.3 and 4.5 mm
- 3 terminals to ensure correct insertion: length 4.5 mm



Specifications and characteristics in brief

Rated voltage V_R Surge voltage V_S	200 ... 450 V DC 1.15 · V_R (for $V_R \leq$ 250 V DC) 1.10 · V_R (for $V_R \geq$ 400 V DC)	
Rated capacitance C_R Capacitance tolerance	100 ... 3300 µF ±20% ≙ M	
Dissipation factor tan δ (20 °C, 120 Hz)	$V_R \leq$ 250 V DC: tan δ ≤ 0.15 $V_R \geq$ 400 V DC: tan δ ≤ 0.20	
Leakage current I_{leak} (5 min, 20 °C)	$I_{leak} \leq 0.3\ \mu A \cdot \left(\frac{C_R}{\mu F} \cdot \frac{V_R}{V}\right)^{0.7} + 4\ \mu A$	
Self-inductance ESL	Approx. 20 nH	
Useful life[1)] 85 °C; V_R; $I_{AC,R}$	> 2000 h	Requirements: $\lvert\Delta C/C\rvert$ ≤ 20% of initial value tan δ ≤ 2 times initial specified limit I_{leak} ≤ initial specified limit
Voltage endurance test 85 °C; V_R	2000 h	Post test requirements: $\lvert\Delta C/C\rvert$ ≤ 10% of initial value tan δ ≤ 1.3 times initial specified limit I_{leak} ≤ initial specified limit
Vibration resistance test	To IEC 60068-2-6, test Fc: Frequency range 10 Hz ... 55 Hz, displacement amplitude 0.35 mm, acceleration max. 5 *g*, duration 3 × 2 h. Capacitor mounted by its body which is rigidly clamped to the work surface.	
Characteristics at low temperature	Max. impedance ratio at 100 Hz	V_R ≤ 250 V; ≥ 400 V $Z_{-25\,°C} / Z_{20\,°C}$: 3; 5 $Z_{-40\,°C} / Z_{20\,°C}$: 7; 14
IEC climatic category	To IEC 60068-1: VR ≤ 250 V DC: 40/085/56 (−40 °C/+85 °C/56 days damp heat test) VR ≥ 400 V DC: 25/085/56 (−25 °C/+85 °C/56 days damp heat test) The capacitors can be operated in the temperature range of −40 °C to +85 °C but the impedance at −40 °C should be taken into consideration.	
Detail specification Sectional specification	Similar to CECC 30301-806 IEC 60384-4	

1) Refer to chapter "General technical information, 5 Useful life" on how to interpret useful life.

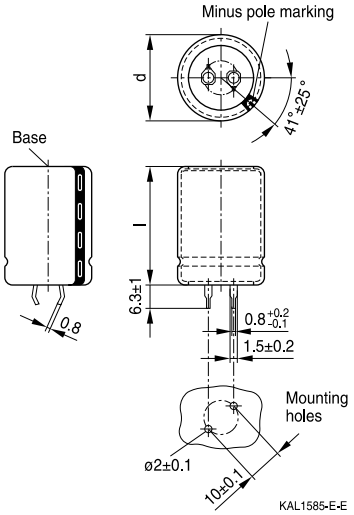


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Ultra compact − 85 °C

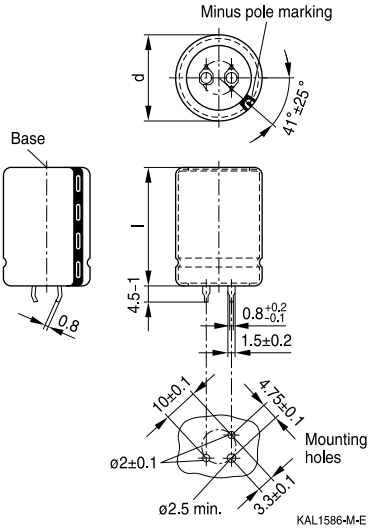
Dimensional drawings

Snap-in capacitors with standard insulation (PVC or PET)



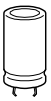
Snap-in terminals, length (6.3 ±1) mm. Also available in a shorter version with a length of (4.5 −1) mm. PET insulation is marked with label "PET" on the sleeve. Safety vent on the base.

Dimensions (mm)		Approx.	Packing
d +1	l ±2	weight (g)	units (pcs.)
22	25	9	160
22	30	12	160
22	35	15	160
22	40	18	160
22	45	20	160
22	50	24	160
25	25	13	130
25	30	17	130
25	35	19	130
25	40	22	130
25	45	25	130
25	50	29	130
25	55	32	130

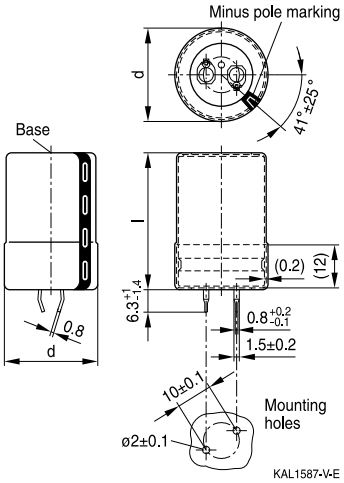


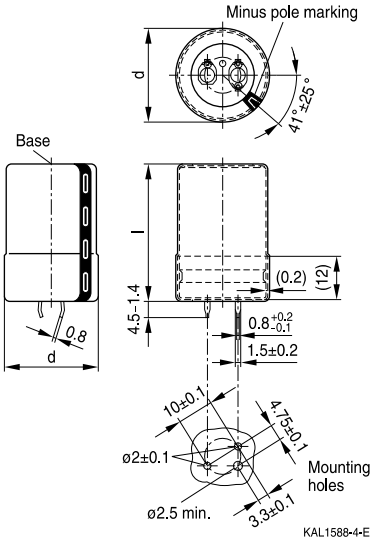
Snap-in capacitors are also available with 3 terminals (length (4.5 −1) mm). PET insulation is marked with label "PET" on the sleeve. Safety vent on the base.

Dimensions (mm)		Approx.	Packing
d +1	l ±2	weight (g)	units (pcs.)
30	25	17	80
30	30	23	80
30	35	29	80
30	40	36	80
30	45	41	80
30	50	46	80
30	55	53	80
35	25	22	60
35	30	29	60
35	35	36	60
35	40	41	60
35	45	56	60
35	50	70	60
35	55	81	60



Snap-in capacitors with PVC insulation and PET insulation cap on terminal side





Snap-in terminals, length (6.3 +1/−1.4) mm. Also available in a shorter version with a length of (4.5 −1.4) mm. PET insulation cap is positioned under the insulation sleeve. Safety vent on the base.

Snap-in capacitors are also available with 3 terminals (length (4.5 −1.4) mm). PET insulation cap is positioned under the insulation sleeve. Safety vent on the base.

Dimensions (mm)		Approx.	Packing
d +1.4	l +2.2/−2	weight (g)	units (pcs.)
22	25	9	160
22	30	12	160
22	35	15	160
22	40	18	160
22	45	20	160
22	50	24	160
25	25	13	115
25	30	17	115
25	35	19	115
25	40	22	115
25	45	25	115
25	50	29	115
25	55	32	115

Dimensions (mm)		Approx.	Packing
d +1.4	l +2.2/−2	weight (g)	units (pcs.)
30	25	17	80
30	30	23	80
30	35	29	80
30	40	36	80
30	45	41	80
30	50	46	80
30	55	53	80
35	25	22	60
35	30	29	60
35	35	36	60
35	40	41	60
35	45	56	60
35	50	70	60
35	55	81	60



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Ultra compact – 85 °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 for terminal styles and insulation features

Identification in 3rd block of ordering code

Snap-in capacitors			
Terminal version	Insulation version		
	PVC	PET	PVC plus PET cap
Standard terminals 6.3 mm	M000	M060	M080
Short terminals 4.5 mm	M007	M067	M087
3 terminals 4.5 mm	M002	M062	M082

Ordering examples:

B43630A9108M007 } snap-in capacitor with short terminals and standard PVC insulation

B43630A9108M062 } snap-in capacitor with 3 terminals and PET insulation

B43630A9108M080 } snap-in capacitor with standard terminals and PVC insulation with additional PET insulation cap on terminal side



Overview of available types

V_R (V DC)	200	250	400	450
	Case dimensions d × l (mm)			
C_R (µF)				
100				22 × 25
120			22 × 25	22 × 30 25 × 25
150			22 × 30	22 × 30 25 × 25
180			22 × 30 25 × 25	22 × 35 25 × 30 30 × 25
220			22 × 35 25 × 30	22 × 40 25 × 35 30 × 25
270		22 × 25	22 × 40 25 × 35 30 × 25	22 × 50 25 × 40 30 × 30 35 × 25
330		22 × 30 25 × 25	22 × 50 25 × 40 30 × 30 35 × 25	25 × 45 30 × 35 35 × 25
390	22 × 25	22 × 30 25 × 25	25 × 45 30 × 35 35 × 25	25 × 50 30 × 35 35 × 30
470	22 × 30 25 × 25	22 × 35 25 × 30	25 × 50 30 × 35 35 × 30	30 × 40 35 × 35
560	22 × 35 25 × 25	22 × 40 25 × 35 30 × 25	25 × 55 30 × 40 35 × 35	30 × 50 35 × 40
680	22 × 35 25 × 30 30 × 25	22 × 45 25 × 35 30 × 30	30 × 50 35 × 40	30 × 55 35 × 45
820	22 × 40 25 × 35 30 × 25	25 × 40 30 × 30 35 × 25	30 × 55 35 × 45	35 × 50



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Ultra compact − 85 °C

V_R (V DC)	200	250	400	450
	Case dimensions d × l (mm)			
C_R (µF)				
1000	22 × 50 25 × 40 30 × 30 35 × 25	25 × 50 30 × 35 35 × 30	35 × 50	35 × 55
1200	25 × 45 30 × 35 35 × 30	25 × 55 30 × 40 35 × 35	35 × 55	
1500	25 × 50 30 × 40 35 × 30	30 × 50 35 × 40		
1800	30 × 45 35 × 35	30 × 55 35 × 45		
2200	30 × 50 35 × 40	35 × 50		
2700	35 × 45			
3300	35 × 55			

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

C_R 100 Hz 20 °C µF	Case dimensions d × l mm	ESR_{typ} 100 Hz 20 °C mΩ	ESR_{typ} 300 Hz 60 °C mΩ	Z_{max} 10 kHz 20 °C mΩ	$I_{AC,max}$ 100 Hz 60 °C A	$I_{AC,R}$ 100 Hz 85 °C A	Ordering code (composition see below)
V_R = 200 V DC							
390	22 × 25	270	90	410	2.84	1.62	B43630A2397M0*#
470	22 × 30	220	75	340	3.28	1.88	B43630A2477M0*#
470	25 × 25	230	80	360	3.14	1.80	B43630B2477M0*#
560	22 × 35	190	60	280	3.74	2.15	B43630A2567M0*#
560	25 × 25	180	70	260	3.45	1.97	B43630B2567M0*#
680	22 × 35	140	50	200	4.25	2.43	B43630A2687M0*#
680	25 × 30	160	60	250	4.00	2.29	B43630B2687M0*#
680	30 × 25	180	75	270	3.75	2.15	B43630C2687M0*#
820	22 × 40	110	40	170	4.91	2.80	B43630A2827M0*#
820	25 × 35	140	50	210	4.61	2.64	B43630B2827M0*#
820	30 × 25	140	70	210	3.98	2.27	B43630C2827M0*#
1000	22 × 50	110	36	170	5.79	3.32	B43630A2108M0*#
1000	25 × 40	110	40	170	5.33	3.05	B43630B2108M0*#
1000	30 × 30	120	55	200	4.68	2.68	B43630C2108M0*#
1000	35 × 25	140	75	230	4.21	2.41	B43630D2108M0*#
1200	25 × 45	95	36	150	6.11	3.49	B43630A2128M0*#
1200	30 × 35	100	45	160	5.39	3.09	B43630B2128M0*#
1200	35 × 30	110	60	180	4.97	3.03	B43630C2128M0*#
1500	25 × 50	65	28	100	7.14	4.08	B43630A2158M0*#
1500	30 × 40	85	38	140	6.25	3.80	B43630B2158M0*#
1500	35 × 30	100	60	170	5.16	3.13	B43630C2158M0*#
1800	30 × 45	70	34	120	7.08	4.31	B43630A2188M0*#
1800	35 × 35	85	50	140	5.96	3.63	B43630B2188M0*#
2200	30 × 50	55	28	85	8.03	4.88	B43630A2228M0*#
2200	35 × 40	70	40	120	6.81	4.14	B43630B2228M0*#
2700	35 × 45	55	36	85	7.66	4.66	B43630A2278M0*#
3300	35 × 55	50	30	80	9.20	5.60	B43630A2338M0*#

Composition of ordering code

* = Insulation feature
- 0 = PVC insulation
- 6 = PET insulation
- 8 = PVC insulation with additional PET insulation cap on terminal side

\# = Terminal style
- 0 = snap-in standard terminals (6.3 mm)
- 2 = snap-in 3 terminals (4.5 mm)
- 7 = snap-in short terminals (4.5 mm)



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Ultra compact − 85 °C

Technical data and ordering codes

C_R 100 Hz 20 °C µF	Case dimensions d × l mm	ESR_{typ} 100 Hz 20 °C mΩ	ESR_{typ} 300 Hz 60 °C mΩ	Z_{max} 10 kHz 20 °C mΩ	$I_{AC,max}$ 100 Hz 60 °C A	$I_{AC,R}$ 100 Hz 85 °C A	Ordering code (composition see below)
V_R = 250 V DC							
270	22 × 25	310	100	450	2.52	1.41	B43630E2277M0*#
330	22 × 30	250	80	370	2.92	1.64	B43630E2337M0*#
330	25 × 25	260	90	380	2.84	1.59	B43630F2337M0*#
390	22 × 30	190	70	270	3.26	1.83	B43630E2397M0*#
390	25 × 25	200	80	280	3.12	1.75	B43630F2397M0*#
470	22 × 35	180	60	260	3.76	2.10	B43630E2477M0*#
470	25 × 30	190	65	270	3.59	2.01	B43630F2477M0*#
560	22 × 40	150	50	220	4.30	2.41	B43630E2567M0*#
560	25 × 35	160	55	230	4.11	2.31	B43630F2567M0*#
560	30 × 25	180	80	260	3.70	2.07	B43630G2567M0*#
680	22 × 45	110	40	160	5.00	2.80	B43630E2687M0*#
680	25 × 35	120	45	170	4.61	2.58	B43630F2687M0*#
680	30 × 30	140	60	210	4.32	2.42	B43630G2687M0*#
820	25 × 40	100	40	140	5.31	2.97	B43630E2827M0*#
820	30 × 30	110	55	170	4.65	2.60	B43630F2827M0*#
820	35 × 25	140	85	220	4.16	2.32	B43630G2827M0*#
1000	25 × 50	90	34	130	6.31	3.53	B43630E2108M0*#
1000	30 × 35	90	45	140	5.39	3.01	B43630F2108M0*#
1000	35 × 30	110	60	180	4.93	2.93	B43630G2108M0*#
1200	25 × 55	65	28	95	7.20	4.03	B43630E2128M0*#
1200	30 × 40	75	40	120	6.15	3.66	B43630F2128M0*#
1200	35 × 35	95	50	150	5.67	3.38	B43630G2128M0*#
1500	30 × 50	65	32	100	7.46	4.44	B43630E2158M0*#
1500	35 × 40	75	40	120	6.50	3.88	B43630F2158M0*#
1800	30 × 55	50	26	75	8.39	5.00	B43630E2188M0*#
1800	35 × 45	65	38	100	7.32	4.36	B43630F2188M0*#
2200	35 × 50	55	34	90	8.26	4.91	B43630E2228M0*#

Composition of ordering code

* = Insulation feature
- 0 = PVC insulation
- 6 = PET insulation
- 8 = PVC insulation with additional PET insulation cap on terminal side

\# = Terminal style
- 0 = snap-in standard terminals (6.3 mm)
- 2 = snap-in 3 terminals (4.5 mm)
- 7 = snap-in short terminals (4.5 mm)



Technical data and ordering codes

C_R 100 Hz 20 °C µF	Case dimensions d × l mm	ESR_{typ} 100 Hz 20 °C mΩ	ESR_{typ} 300 Hz 60 °C mΩ	Z_{max} 10 kHz 20 °C mΩ	$I_{AC,max}$ 100 Hz 60 °C A	$I_{AC,R}$ 100 Hz 85 °C A	Ordering code (composition see below)
V_R = 400 V DC							
120	22 × 25	850	220	1300	1.62	0.93	B43630A9127M0*#
150	22 × 30	680	180	1100	1.90	1.09	B43630A9157M0*#
180	22 × 30	570	150	850	2.16	1.24	B43630A9187M0*#
180	25 × 25	580	160	860	2.13	1.22	B43630B9187M0*#
220	22 × 35	470	120	690	2.51	1.44	B43630A9227M0*#
220	25 × 30	470	130	700	2.47	1.41	B43630B9227M0*#
270	22 × 40	400	110	600	2.95	1.69	B43630A9277M0*#
270	25 × 35	420	110	640	2.87	1.65	B43630B9277M0*#
270	30 × 25	440	140	680	2.75	1.57	B43630C9277M0*#
330	22 × 50	340	90	520	3.48	1.99	B43630A9337M0*#
330	25 × 40	350	95	530	3.34	1.91	B43630B9337M0*#
330	30 × 30	360	110	550	3.19	1.83	B43630C9337M0*#
330	35 × 25	370	120	580	3.11	1.78	B43630D9337M0*#
390	25 × 45	290	80	450	3.79	2.17	B43630A9397M0*#
390	30 × 35	300	90	460	3.61	2.07	B43630B9397M0*#
390	35 × 25	320	120	490	3.31	1.89	B43630C9397M0*#
470	25 × 50	240	65	380	4.37	2.50	B43630A9477M0*#
470	30 × 35	240	80	380	4.02	2.30	B43630B9477M0*#
470	35 × 30	270	95	420	3.85	2.34	B43630C9477M0*#
560	25 × 55	200	55	300	5.02	2.87	B43630A9567M0*#
560	30 × 40	210	65	320	4.58	2.79	B43630B9567M0*#
560	35 × 35	220	75	350	4.39	2.68	B43630C9567M0*#
680	30 × 50	180	55	270	5.39	3.29	B43630A9687M0*#
680	35 × 40	180	65	290	5.01	3.05	B43630B9687M0*#
820	30 × 55	150	45	230	6.17	3.76	B43630A9827M0*#
820	35 × 45	150	55	240	5.68	3.46	B43630B9827M0*#
1000	35 × 50	130	45	200	6.48	3.94	B43630A9108M0*#
1200	35 × 55	100	40	170	7.30	4.44	B43630A9128M0*#

Composition of ordering code

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- 0 = PVC insulation
- 6 = PET insulation
- 8 = PVC insulation with additional PET insulation cap on terminal side

\# = Terminal style
- 0 = snap-in standard terminals (6.3 mm)
- 2 = snap-in 3 terminals (4.5 mm)
- 7 = snap-in short terminals (4.5 mm)



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Ultra compact – 85 °C

Technical data and ordering codes

C_R 100 Hz 20 °C µF	Case dimensions d × l mm	ESR_{typ} 100 Hz 20 °C mΩ	ESR_{typ} 300 Hz 60 °C mΩ	Z_{max} 10 kHz 20 °C mΩ	$I_{AC,max}$ 100 Hz 60 °C A	$I_{AC,R}$ 100 Hz 85 °C A	Ordering code (composition see below)
V_R = 450 V DC							
100	22 × 25	1100	280	1700	1.51	0.85	B43630A5107M0*#
120	22 × 30	900	230	1400	1.72	0.98	B43630A5127M0*#
120	25 × 25	910	240	1400	1.72	0.98	B43630B5127M0*#
150	22 × 30	730	190	1100	2.01	1.14	B43630A5157M0*#
150	25 × 25	740	200	1200	2.00	1.13	B43630B5157M0*#
180	22 × 35	610	160	920	2.31	1.31	B43630A5187M0*#
180	25 × 30	610	160	930	2.27	1.29	B43630B5187M0*#
180	30 × 25	660	180	1100	2.29	1.30	B43630C5187M0*#
220	22 × 40	500	130	770	2.70	1.53	B43630A5227M0*#
220	25 × 35	530	140	820	2.63	1.49	B43630B5227M0*#
220	30 × 25	550	160	850	2.57	1.46	B43630C5227M0*#
270	22 × 50	430	110	660	3.19	1.81	B43630A5277M0*#
270	25 × 40	430	110	670	3.07	1.74	B43630B5277M0*#
270	30 × 30	440	120	690	2.98	1.69	B43630C5277M0*#
270	35 × 25	460	140	710	2.94	1.67	B43630D5277M0*#
330	25 × 45	360	95	550	3.58	2.03	B43630A5337M0*#
330	30 × 35	360	100	560	3.44	1.95	B43630B5337M0*#
330	35 × 25	370	130	580	3.22	1.82	B43630C5337M0*#
390	25 × 50	300	80	470	4.07	2.30	B43630A5397M0*#
390	30 × 35	300	90	460	3.81	2.15	B43630B5397M0*#
390	35 × 30	320	100	500	3.69	2.22	B43630C5397M0*#
470	30 × 40	250	75	380	4.37	2.63	B43630A5477M0*#
470	35 × 35	270	85	420	4.21	2.54	B43630B5477M0*#
560	30 × 50	220	60	340	5.06	3.05	B43630A5567M0*#
560	35 × 40	220	70	350	4.77	2.88	B43630B5567M0*#
680	30 × 55	180	55	280	5.84	3.52	B43630A5687M0*#
680	35 × 45	180	60	290	5.45	3.29	B43630B5687M0*#
820	35 × 50	160	50	250	6.19	3.73	B43630A5827M0*#
1000	35 × 55	120	45	200	7.09	4.26	B43630A5108M0*#

Composition of ordering code

* = Insulation feature
- 0 = PVC insulation
- 6 = PET insulation
- 8 = PVC insulation with additional PET insulation cap on terminal side

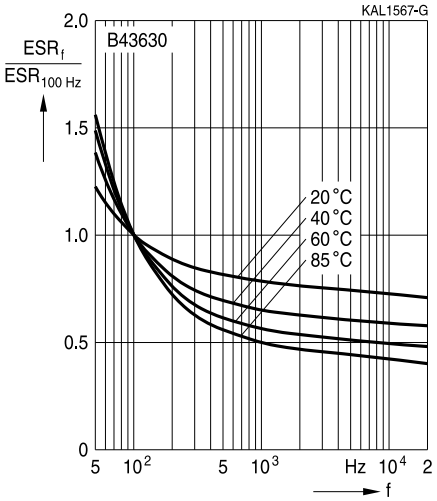
\# = Terminal style
- 0 = snap-in standard terminals (6.3 mm)
- 2 = snap-in 3 terminals (4.5 mm)
- 7 = snap-in short terminals (4.5 mm)



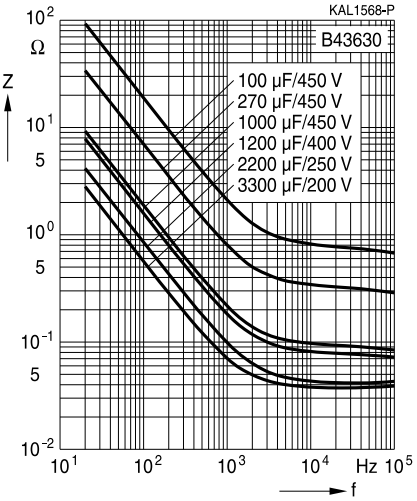
Useful life[1)]

For useful life calculations, please use our web-based "AlCap Useful Life Calculation Tool", which can be found on the Internet under the following link
http://www.epcos.com/designtools/alu_useful_life/Useful_life.swf.
The AlCap Useful Life Calculation Tool provides calculations of useful life as well as additional data for selected capacitor types under operating conditions defined by the user.

Frequency characteristics of ESR
Typical behavior



Impedance Z versus frequency f
Typical behavior at 20 °C



1) Refer to chapter "General technical information, 5 Useful life" on how to interpret useful life.



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Ultra compact – 85 °C

Cautions and warnings

Personal safety

The electrolytes used by EPCOS have been optimized both with a view to the intended application and with regard to health and environmental compatibility. They do not contain any solvents that are detrimental to health, e.g. dimethyl formamide (DMF) or dimethyl acetamide (DMAC).
Furthermore, some of the high-voltage electrolytes used by EPCOS are self-extinguishing.

As far as possible, EPCOS does not use any dangerous chemicals or compounds to produce operating electrolytes. However, in exceptional cases, such materials must be used in order to achieve specific physical and electrical properties because no alternative materials are currently known. However, the amount of dangerous materials used in our products is limited to an absolute minimum.

Materials and chemicals used in EPCOS aluminum electrolytic capacitors are continuously adapted in compliance with the EPCOS Corporate Environmental Policy and the latest EU regulations and guidelines such as RoHS, REACH/SVHC, GADSL, and ELV.

MDS (Material Data Sheets) are available on the EPCOS website for all types listed in the data book. MDS for customer specific capacitors are available upon request.
MSDS (Material Safety Data Sheets) are available for all of our electrolytes upon request.

Nevertheless, the following rules should be observed when handling aluminum electrolytic capacitors: No electrolyte should come into contact with eyes or skin. If electrolyte does come into contact with the skin, wash the affected areas immediately with running water. If the eyes are affected, rinse them for 10 minutes with plenty of water. If symptoms persist, seek medical treatment. Avoid inhaling electrolyte vapor or mists. Workplaces and other affected areas should be well ventilated. Clothing that has been contaminated by electrolyte must be changed and rinsed in water.



Product safety

The table below summarizes the safety instructions that must be observed without fail. A detailed description can be found in the relevant sections of chapter "General technical information".

Topic	Safety information	Reference chapter "General technical information"
Polarity	Make sure that polar capacitors are connected with the right polarity.	1 "Basic construction of aluminum electrolytic capacitors"
Reverse voltage	Voltages of opposite polarity should be prevented by connecting a diode.	3.1.6 "Reverse voltage"
Mounting position of screw-terminal capacitors	Screw terminal capacitors must not be mounted with terminals facing down unless otherwise specified.	11.1. "Mounting positions of capacitors with screw terminals"
Robustness of terminals	The following maximum tightening torques must not be exceeded when connecting screw terminals: M5: 2.5 Nm M6: 4.0 Nm	11.3 "Mounting torques"
Mounting of single-ended capacitors	The internal structure of single-ended capacitors might be damaged if excessive force is applied to the lead wires. Avoid any compressive, tensile or flexural stress. Do not move the capacitor after soldering to PC board. Do not pick up the PC board by the soldered capacitor. Do not insert the capacitor on the PC board with a hole space different to the lead space specified.	11.4 "Mounting considerations for single-ended capacitors"
Soldering	Do not exceed the specified time or temperature limits during soldering.	11.5 "Soldering"
Soldering, cleaning agents	Do not allow halogenated hydrocarbons to come into contact with aluminum electrolytic capacitors.	11.6 "Cleaning agents"
Upper category temperature	Do not exceed the upper category temperature.	7.2 "Maximum permissible operating temperature"
Passive flammability	Avoid external energy, e.g. fire.	8.1 "Passive flammability"



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Topic	Safety information	Reference chapter "General technical information"
Active flammability	Avoid overload of the capacitors.	8.2 "Active flammability"
Maintenance	Make periodic inspections of the capacitors. Before the inspection, make sure that the power supply is turned off and carefully discharge the electricity of the capacitors. Do not apply excessive mechanical stress to the capacitor terminals when mounting.	10 "Maintenance"
Storage	Do not store capacitors at high temperatures or high humidity. Capacitors should be stored at +5 to +35 °C and a relative humidity of ≤ 75%.	7.3 "Shelf life and storage conditions"
		Reference chapter "Capacitors with screw terminals"
Breakdown strength of insulating sleeves	Do not damage the insulating sleeve, especially when ring clips are used for mounting.	"Screw terminals − accessories"

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



Symbols and terms

Symbol	English	German
C	Capacitance	Kapazität
C_R	Rated capacitance	Nennkapazität
C_S	Series capacitance	Serienkapazität
$C_{S,T}$	Series capacitance at temperature T	Serienkapazität bei Temperatur T
C_f	Capacitance at frequency f	Kapazität bei Frequenz f
d	Case diameter, nominal dimension	Gehäusedurchmesser, Nennmaß
d_{max}	Maximum case diameter	Maximaler Gehäusedurchmesser
ESL	Self-inductance	Eigeninduktivität
ESR	Equivalent series resistance	Ersatzserienwiderstand
ESR_f	Equivalent series resistance at frequency f	Ersatzserienwiderstand bei Frequenz f
ESR_T	Equivalent series resistance at temperature T	Ersatzserienwiderstand bei Temperatur T
f	Frequency	Frequenz
I	Current	Strom
I_{AC}	Alternating current (ripple current)	Wechselstrom
$I_{AC,RMS}$	Root-mean-square value of alternating current	Wechselstrom, Effektivwert
$I_{AC,f}$	Ripple current at frequency f	Wechselstrom bei Frequenz f
$I_{AC,max}$	Maximum permissible ripple current	Maximal zulässiger Wechselstrom
$I_{AC,R}$	Rated ripple current	Nennwechselstrom
I_{leak}	Leakage current	Reststrom
$I_{leak,op}$	Operating leakage current	Betriebsreststrom
l	Case length, nominal dimension	Gehäuselänge, Nennmaß
l_{max}	Maximum case length (without terminals and mounting stud)	Maximale Gehäuselänge (ohne Anschlüsse und Gewindebolzen)
R	Resistance	Widerstand
R_{ins}	Insulation resistance	Isolationswiderstand
R_{symm}	Balancing resistance	Symmetrierwiderstand
T	Temperature	Temperatur
ΔT	Temperature difference	Temperaturdifferenz
T_A	Ambient temperature	Umgebungstemperatur
T_C	Case temperature	Gehäusetemperatur
T_B	Capacitor base temperature	Temperatur des Gehäusebodens
t	Time	Zeit
Δt	Period	Zeitraum
t_b	Service life (operating hours)	Brauchbarkeitsdauer (Betriebszeit)



Symbol	English	German
V	Voltage	Spannung
V_F	Forming voltage	Formierspannung
V_{op}	Operating voltage	Betriebsspannung
V_R	Rated voltage, DC voltage	Nennspannung, Gleichspannung
V_S	Surge voltage	Spitzenspannung
X_C	Capacitive reactance	Kapazitiver Blindwiderstand
X_L	Inductive reactance	Induktiver Blindwiderstand
Z	Impedance	Scheinwiderstand
Z_T	Impedance at temperature T	Scheinwiderstand bei Temperatur T
tan δ	Dissipation factor	Verlustfaktor
λ	Failure rate	Ausfallrate
ε_0	Absolute permittivity	Elektrische Feldkonstante
ε_r	Relative permittivity	Dielektrizitätszahl
ω	Angular velocity; $2 \cdot \pi \cdot f$	Kreisfrequenz; $2 \cdot \pi \cdot f$

Note

All dimensions are given in mm.

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, FilterCap, FormFit, LeaXield, MiniBlue, MiniCell, MKD, MKK, MLSC, 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.vvv