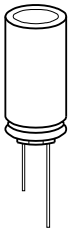
Aluminum electrolytic capacitors

Single-ended capacitors

Series/Type: **B41896**

Date: November 2012

Long-life grade capacitors



Applications
- Automotive electronics

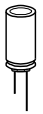
Features
- Very long useful life
- High operating temperature capability up to 135 °C
- High ripple current capability
- Low ESR
- RoHS-compatible

Construction
- Radial leads
- Charge-discharge proof, polar
- Aluminum case with insulating sleeve
- Minus pole marking on the insulating sleeve
- Case with safety vent

Delivery mode

Terminal configurations and packing:
- Bulk
- Taped, Ammo pack
- Cut
- Kinked
- PAPR (protection against polarity reversal):
  crimped leads, J leads, bent leads

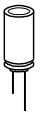
Refer to chapter "Single-ended capacitors – Taping, packing and lead configurations" for further details.



Specifications and characteristics in brief

Rated voltage V_R	10 ... 50 V DC				
Surge voltage V_S	1.15 · V_R				
Rated capacitance C_R	180 ... 10000 µF				
Capacitance tolerance	±20% ≙ M				
Dissipation factor tan δ (20 °C, 120 Hz)	For capacitance higher than 1000 µF add 0.02 for every increase of 1000 µF.				
	V_R (V DC)	10	16 ... 25	35	50
	tan δ (max.)	0.20	0.17	0.12	0.10
Leakage current I_{leak} (20 °C, 5 min)	$I_{leak} = 0.01\ \mu A \cdot \left(\frac{C_R}{\mu F} \cdot \frac{V_R}{V}\right)$ or 3 µA, whichever is greater				
Self-inductance ESL	Diameter (mm)	≤ 12.5	16	18	
	ESL (nH)	20	26	34	
Useful life[1)]					
125 °C; V_R; $I_{AC,R}$	> 3500 h for d = 10 mm > 7000 h for d ≥ 12.5 mm				
135 °C; V_R; 0.75 · $I_{AC,R}$	> 1000 h for d = 10 mm > 3000 h for d ≥ 12.5 mm				
Requirements	ΔC/C ≤ ±35% of initial value tan δ ≤ 3 times initial specified limit I_{leak} ≤ initial specified limit				
Voltage endurance test					
125 °C, V_R	3500 h for d = 10 mm 7000 h for d ≥ 12.5 mm				
Post test requirements	ΔC/C ≤ ±30% of initial value tan δ ≤ 2 times initial specified limit I_{leak} ≤ initial specified limit				
Vibration resistance test	To IEC 60068-2-6, test Fc: Frequency range 10 Hz … 2 kHz, displacement amplitude max. 1.5 mm, acceleration max. 20 *g*, duration 3 × 2 h. Capacitor rigidly clamped by the aluminum case.				
IEC climatic category	To IEC 60068-1: 55/125/56 (−55 °C/+125 °C/56 days damp heat test)				
Sectional specification	IEC 60384-4, AEC-Q200				

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



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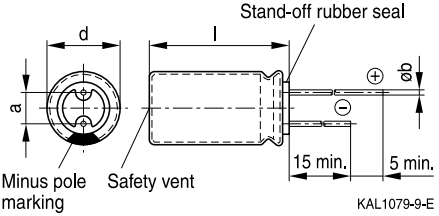
Up to 135 °C

Dimensional drawing

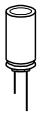
With stand-off rubber seal

Diameters (mm): 10, 12.5, 16, 18



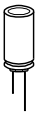
Dimensions and weights

Dimensions (mm)				Approx. weight
d +0.5	l	a ±0.5	b	g
10	20 +2.0	5.0	0.60 ±0.05	2.6
12.5	20 +2.0	5.0	0.60 ±0.05	3.6
12.5	25 +2.0	5.0	0.60 ±0.05	4.5
12.5	30 +2.0	5.0	0.80 ±0.05	5.3
12.5	40 +2.0	5.0	0.80 ±0.05	7.4
16	20 +2.0	7.5	0.80 ±0.05	5.5
16	25 +2.0	7.5	0.80 ±0.05	7.5
16	31.5 +2.0	7.5	0.80 ±0.05	7.8
16	35.5 +2.0	7.5	0.80 ±0.05	9.2
18	20 +2.0	7.5	0.80 ±0.1	8.0
18	25 +2.0	7.5	0.80 ±0.1	9.0
18	31.5 +2.0	7.5	0.80 ±0.1	11.0
18	35 +2.0	7.5	0.80 ±0.1	13.0
18	40 +2.5	7.5	0.80 ±0.1	16.0



Overview of available types

V_R (V DC)	10	16	25	35	50
	Case dimensions d × l (mm)				
C_R (µF)					
180					10 × 20
220					10 × 20
270				10 × 20	12.5 × 20
330				10 × 20	12.5 × 20
390				12.5 × 20	12.5 × 25
470			10 × 20	12.5 × 20	12.5 × 25 16 × 20
560			10 × 20	12.5 × 25	16 × 20
680			10 × 20	12.5 × 25	16 × 25 18 × 20
820	10 × 20	10 × 20	12.5 × 20	16 × 20	16 × 31.5
1000	10 × 20	12.5 × 20	12.5 × 25 16 × 20	12.5 × 40 16 × 25 18 × 20	16 × 31.5
1200	12.5 × 20	12.5 × 20	12.5 × 25	16 × 25 18 × 20	18 × 31.5
1500	12.5 × 20	12.5 × 25	16 × 20	16 × 31.5 18 × 25	18 × 35
1800	12.5 × 20	12.5 × 25	12.5 × 40 16 × 25 18 × 20	16 × 31.5	18 × 40
2000				16 × 35.5 18 × 31.5	
2200	12.5 × 25	12.5 × 30 16 × 20	16 × 31.5 18 × 25	18 × 35	
2700	16 × 20	16 × 25 18 × 20	16 × 31.5	18 × 40	
3300	16 × 25	16 × 31.5	16 × 35.5 18 × 31.5		
3900	16 × 25 18 × 20	16 × 31.5	18 × 35		



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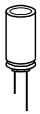
Up to 135 °C

V_R (V DC)	10	16	25	35	50
	Case dimensions d × l (mm)				
C_R (µF)					
4700	16 × 31.5	18 × 31.5	18 × 40		
5600	16 × 31.5	18 × 35			
6800	18 × 31.5	18 × 40			
8200	18 × 35				
10000	18 × 40				

Other voltage and capacitance ratings are available upon request.



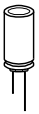
Technical data and ordering codes

C_R 120 Hz 20 °C µF	Case dimensions d × l mm	ESR_{max} 10 kHz −40 °C Ω	ESR_{max} 10 kHz 20 °C Ω	Z_{max} 100 kHz 20 °C Ω	$I_{AC,R}$ 100 kHz 125 °C mA	Ordering code (composition see below)
V_R = 10 V DC						
820	10 × 20	0.592	0.074	0.062	1205	B41896C3827M***
1000	10 × 20	0.592	0.074	0.062	1205	B41896C3108M***
1200	12.5 × 20	0.484	0.061	0.055	1820	B41896C3128M***
1500	12.5 × 20	0.484	0.061	0.055	1820	B41896C3158M***
1800	12.5 × 20	0.484	0.061	0.055	1820	B41896C3188M***
2200	12.5 × 25	0.285	0.041	0.038	2280	B41896C3228M***
2700	16 × 20	0.299	0.037	0.034	2280	B41896C3278M***
3300	16 × 25	0.238	0.030	0.026	2860	B41896C3338M***
3900	16 × 25	0.238	0.030	0.026	2860	B41896C3398M***
3900	18 × 20	0.273	0.034	0.031	2490	B41896D3398M***
4700	16 × 31.5	0.185	0.023	0.022	3160	B41896C3478M***
5600	16 × 31.5	0.185	0.023	0.022	3160	B41896C3568M***
6800	18 × 31.5	0.178	0.022	0.021	3500	B41896C3688M***
8200	18 × 35	0.178	0.022	0.019	3840	B41896C3828M***
10000	18 × 40	0.150	0.019	0.016	4230	B41896C3109M***

Composition of ordering code

*** = Version

- 000 = for standard leads, bulk
- 001 = for kinked leads, bulk (for d × l = 10 × 20 ... 12.5 × 25 mm and ∅ 16 ... 18 mm)
- 002 = for cut leads, bulk (for d × l = 10 × 20 ... 12.5 × 25 mm and ∅ 16 ... 18 mm)
- 003 = for crimped leads, blister (for ∅ 16 ... 18 mm)
- 004 = for J leads, blister (for ∅ 10 ... 18 mm, excluding d × l = 12.5 × 30/40 and 18 × 40 mm)
- 008 = for taped leads, Ammo pack, lead spacing F = 5.0 mm (for d × l = 10 × 20 ... 12.5 × 25 mm)
- 009 = for taped leads, Ammo pack, lead spacing F = 7.5 mm (for d × l = 16 × 20 ... 16 × 31.5 mm and 18 × 20 ... 18 × 31.5 mm)
- 012 = for bent 90° leads, blister (for ∅ 16 ... 18 mm)



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Up to 135 °C

Technical data and ordering codes

C_R 120 Hz 20 °C µF	Case dimensions d × l mm	ESR_{max} 10 kHz −40 °C Ω	ESR_{max} 10 kHz 20 °C Ω	Z_{max} 100 kHz 20 °C Ω	$I_{AC,R}$ 100 kHz 125 °C mA	Ordering code (composition see below)
V_R = 16 V DC						
820	10 × 20	0.592	0.074	0.062	1205	B41896C4827M***
1000	12.5 × 20	0.484	0.061	0.055	1820	B41896C4108M***
1200	12.5 × 20	0.484	0.061	0.055	1820	B41896C4128M***
1500	12.5 × 25	0.285	0.041	0.038	2280	B41896C4158M***
1800	12.5 × 25	0.285	0.041	0.038	2280	B41896C4188M***
2200	12.5 × 30	0.238	0.030	0.026	2860	B41896C4228M***
2200	16 × 20	0.299	0.037	0.034	2280	B41896D4228M***
2700	16 × 25	0.238	0.030	0.026	2860	B41896C4278M***
2700	18 × 20	0.273	0.034	0.031	2490	B41896D4278M***
3300	16 × 31.5	0.185	0.023	0.022	3160	B41896C4338M***
3900	16 × 31.5	0.185	0.023	0.022	3160	B41896C4398M***
4700	18 × 31.5	0.178	0.022	0.021	3500	B41896C4478M***
5600	18 × 35	0.178	0.022	0.019	3840	B41896C4568M***
6800	18 × 40	0.150	0.019	0.016	4230	B41896C4688M***

Composition of ordering code

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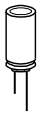
- 000 = for standard leads, bulk
- 001 = for kinked leads, bulk (for d × l = 10 × 20 ... 12.5 × 25 mm and ∅ 16 ... 18 mm)
- 002 = for cut leads, bulk (for d × l = 10 × 20 ... 12.5 × 25 mm and ∅ 16 ... 18 mm)
- 003 = for crimped leads, blister (for ∅ 16 ... 18 mm)
- 004 = for J leads, blister (for ∅ 10 ... 18 mm, excluding d × l = 12.5 × 30/40 and 18 × 40 mm)
- 008 = for taped leads, Ammo pack, lead spacing F = 5.0 mm (for d × l = 10 × 20 ... 12.5 × 25 mm)
- 009 = for taped leads, Ammo pack, lead spacing F = 7.5 mm (for d × l = 16 × 20 ... 16 × 31.5 mm and 18 × 20 ... 18 × 31.5 mm)
- 012 = for bent 90° leads, blister (for ∅ 16 ... 18 mm)



Technical data and ordering codes

C_R 120 Hz 20 °C µF	Case dimensions d × l mm	ESR_{max} 10 kHz −40 °C Ω	ESR_{max} 10 kHz 20 °C Ω	Z_{max} 100 kHz 20 °C Ω	$I_{AC,R}$ 100 kHz 125 °C mA	Ordering code (composition see below)
V_R = 25 V DC						
470	10 × 20	0.592	0.074	0.062	1205	B41896C5477M***
560	10 × 20	0.592	0.074	0.062	1205	B41896C5567M***
680	10 × 20	0.592	0.074	0.062	1205	B41896C5687M***
820	12.5 × 20	0.484	0.061	0.055	1820	B41896C5827M***
1000	12.5 × 25	0.285	0.041	0.038	2280	B41896C5108M***
1000	16 × 20	0.299	0.037	0.034	2280	B41896D5108M***
1200	12.5 × 25	0.285	0.041	0.038	2280	B41896C5128M***
1500	16 × 20	0.299	0.037	0.034	2280	B41896C5158M***
1800	12.5 × 40	0.181	0.023	0.021	3340	B41896C5188M***
1800	16 × 25	0.238	0.030	0.026	2860	B41896D5188M***
1800	18 × 20	0.273	0.034	0.031	2490	B41896E5188M***
2200	16 × 31.5	0.185	0.023	0.022	3160	B41896C5228M***
2200	18 × 25	0.229	0.029	0.025	3010	B41896D5228M***
2700	16 × 31.5	0.185	0.023	0.022	3160	B41896C5278M***
3300	16 × 35.5	0.180	0.022	0.020	3467	B41896D5338M***
3300	18 × 31.5	0.178	0.022	0.021	3500	B41896C5338M***
3900	18 × 35	0.178	0.022	0.019	3840	B41896C5398M***
4700	18 × 40	0.150	0.019	0.016	4230	B41896C5478M***

Composition of ordering code

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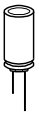
- 002 = for cut leads, bulk (for d × l = 10 × 20 ... 12.5 × 25 mm and ∅ 16 ... 18 mm)
- 003 = for crimped leads, blister (for ∅ 16 ... 18 mm)
- 004 = for J leads, blister (for ∅ 10 ... 18 mm, excluding d × l = 12.5 × 30/40 and 18 × 40 mm)
- 008 = for taped leads, Ammo pack, lead spacing F = 5.0 mm (for d × l = 10 × 20 ... 12.5 × 25 mm)
- 009 = for taped leads, Ammo pack, lead spacing F = 7.5 mm (for d × l = 16 × 20 ... 16 × 31.5 mm and 18 × 20 ... 18 × 31.5 mm)
- 012 = for bent 90° leads, blister (for ∅ 16 ... 18 mm)



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Up to 135 °C

Technical data and ordering codes

C_R 120 Hz 20 °C µF	Case dimensions d × l mm	ESR_{max} 10 kHz −40 °C Ω	ESR_{max} 10 kHz 20 °C Ω	Z_{max} 100 kHz 20 °C Ω	$I_{AC,R}$ 100 kHz 125 °C mA	Ordering code (composition see below)
V_R = 35 V DC						
270	10 × 20	0.592	0.074	0.062	1205	B41896C7277M***
330	10 × 20	0.592	0.074	0.062	1205	B41896C7337M***
390	12.5 × 20	0.484	0.061	0.055	1820	B41896C7397M***
470	12.5 × 20	0.484	0.061	0.055	1820	B41896C7477M***
560	12.5 × 25	0.285	0.041	0.038	2280	B41896C7567M***
680	12.5 × 25	0.285	0.041	0.038	2280	B41896C7687M***
820	16 × 20	0.299	0.037	0.034	2280	B41896C7827M***
1000	12.5 × 40	0.181	0.023	0.021	3340	B41896C7108M***
1000	16 × 25	0.238	0.030	0.026	2860	B41896D7108M***
1000	18 × 20	0.273	0.034	0.031	2490	B41896E7108M***
1200	16 × 25	0.238	0.030	0.026	2860	B41896C7128M***
1200	18 × 20	0.273	0.034	0.031	2490	B41896D7128M***
1500	16 × 31.5	0.185	0.023	0.022	3160	B41896C7158M***
1500	18 × 25	0.232	0.029	0.025	3010	B41896D7158M***
1800	16 × 31.5	0.185	0.023	0.022	3160	B41896C7188M***
2000	16 × 35.5	0.180	0.022	0.020	3467	B41896C7208M***
2000	18 × 31.5	0.176	0.022	0.021	3500	B41896D7208M***
2200	18 × 35	0.178	0.022	0.019	3840	B41896C7228M***
2700	18 × 40	0.150	0.019	0.016	4230	B41896C7278M***

Composition of ordering code

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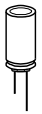
- 002 = for cut leads, bulk (for d × l = 10 × 20 ... 12.5 × 25 mm and ∅ 16 ... 18 mm)
- 003 = for crimped leads, blister (for ∅ 16 ... 18 mm)
- 004 = for J leads, blister (for ∅ 10 ... 18 mm, excluding d × l = 12.5 × 30/40 and 18 × 40 mm)
- 008 = for taped leads, Ammo pack, lead spacing F = 5.0 mm (for d × l = 10 × 20 ... 12.5 × 25 mm)
- 009 = for taped leads, Ammo pack, lead spacing F = 7.5 mm (for d × l = 16 × 20 ... 16 × 31.5 mm and 18 × 20 ... 18 × 31.5 mm)
- 012 = for bent 90° leads, blister (for ∅ 16 ... 18 mm)



Technical data and ordering codes

C_R 120 Hz 20 °C µF	Case dimensions d × l mm	ESR_{max} 10 kHz −40 °C Ω	ESR_{max} 10 kHz 20 °C Ω	Z_{max} 100 kHz 20 °C Ω	$I_{AC,R}$ 100 kHz 125 °C mA	Ordering code (composition see below)
V_R = 50 V DC						
180	10 × 20	0.592	0.074	0.062	1205	B41896C6187M***
220	10 × 20	0.592	0.074	0.062	1205	B41896C6227M***
270	12.5 × 20	0.484	0.061	0.055	1820	B41896C6277M***
330	12.5 × 20	0.484	0.061	0.055	1820	B41896C6337M***
390	12.5 × 25	0.352	0.044	0.041	2280	B41896D6397M***
470	12.5 × 25	0.352	0.044	0.041	2280	B41896E6477M***
470	16 × 20	0.299	0.037	0.034	2280	B41896D6477M***
560	16 × 20	0.299	0.037	0.034	2280	B41896C6567M***
680	16 × 25	0.238	0.030	0.026	2860	B41896C6687M***
680	18 × 20	0.273	0.034	0.031	2490	B41896D6687M***
820	16 × 31.5	0.185	0.023	0.022	3160	B41896C6827M***
1000	16 × 31.5	0.185	0.023	0.022	3160	B41896C6108M***
1200	18 × 31.5	0.178	0.022	0.021	3500	B41896C6128M***
1500	18 × 35	0.178	0.022	0.019	3840	B41896C6158M***
1800	18 × 40	0.150	0.019	0.016	4230	B41896C6188M***

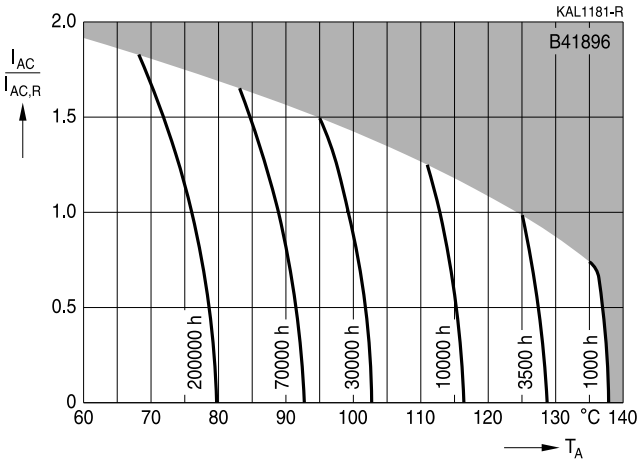
Composition of ordering code

*** = Version

- 000 = for standard leads, bulk
- 001 = for kinked leads, bulk (for d × l = 10 × 20 ... 12.5 × 25 mm and ∅ 16 ... 18 mm)
- 002 = for cut leads, bulk (for d × l = 10 × 20 ... 12.5 × 25 mm and ∅ 16 ... 18 mm)
- 003 = for crimped leads, blister (for ∅ 16 ... 18 mm)
- 004 = for J leads, blister (for ∅ 10 ... 18 mm, excluding d × l = 12.5 × 30/40 and 18 × 40 mm)
- 008 = for taped leads, Ammo pack, lead spacing F = 5.0 mm (for d × l = 10 × 20 ... 12.5 × 25 mm)
- 009 = for taped leads, Ammo pack, lead spacing F = 7.5 mm (for d × l = 16 × 20 ... 16 × 31.5 mm and 18 × 20 ... 18 × 31.5 mm)
- 012 = for bent 90° leads, blister (for ∅ 16 ... 18 mm)

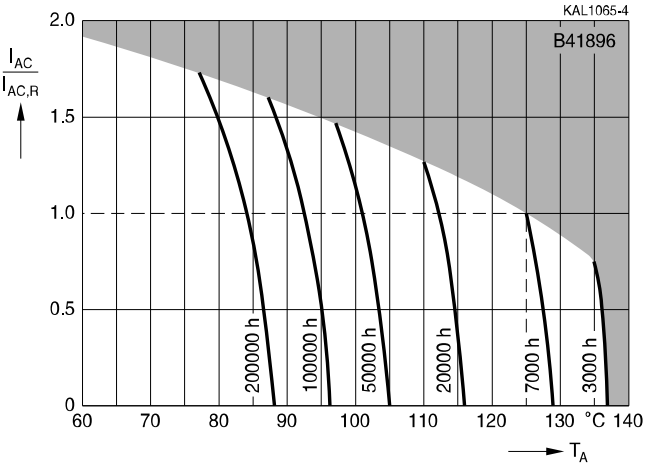
Useful life[1)]
depending on ambient temperature T_A under ripple current operating conditions

d = 10 mm

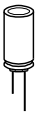


Useful life[1)]
depending on ambient temperature T_A under ripple current operating conditions

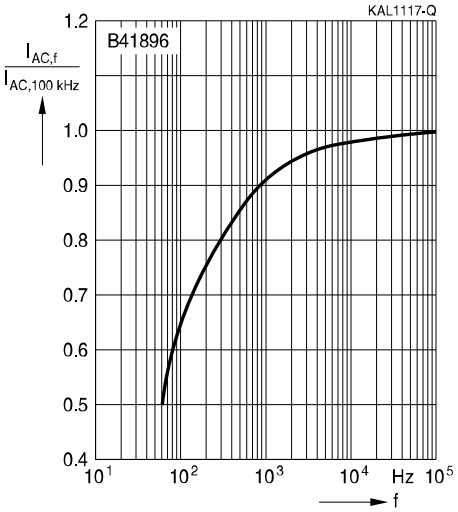
d ≥ 12.5 mm

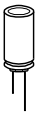


1) Refer to chapter "General technical information, 5 Useful life" on how to interpret useful life.



Frequency factor of permissible ripple current I_{AC} versus frequency f





B41896

Up to 135 °C

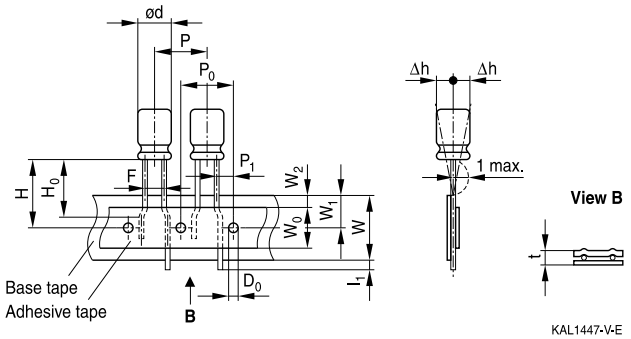
Taping, packing and lead configurations

Taping

Single-ended capacitors are available taped in Ammo pack from diameter 8 to 18 mm as follows:

Lead spacing F = 3.5 mm (∅ d = 8 mm)
Lead spacing F = 5.0 mm (∅ d = 8 … 12.5 mm)
Lead spacing F = 7.5 mm (∅ d = 16 ... 18 mm).

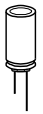
Lead spacing 3.5 mm (∅ d = 8 mm)
Last 3 digits of ordering code: 006



Dimensions in mm

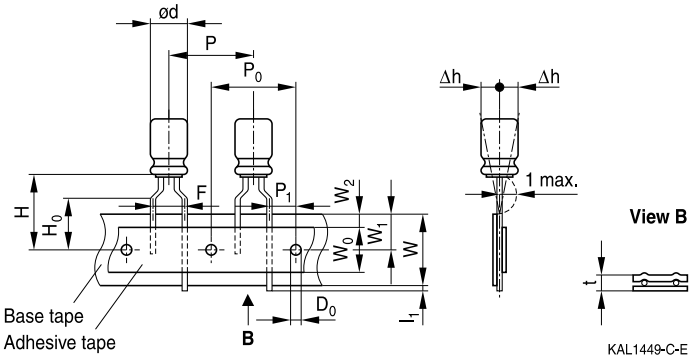
∅ d	F	H	W	W_0	W_1	W_2	P	P_0	P_1	l_1	t	Δh	D_0
8	3.5	18.5	18.0	9.5	9.0	3.0	12.7	12.7	4.6	1.0	0.7	1.0	4.0
Tolerance	+0.8 −0.2	±1.0	±0.5	min.	±0.5	max.	±1.0	±0.3	±0.6	max.	±0.2	max.	±0.2

Leads can also run straight through the taping area.



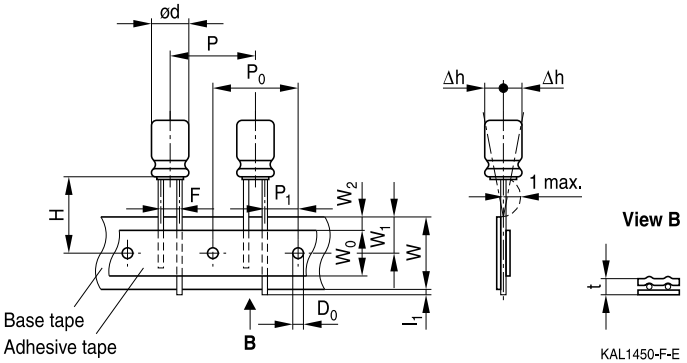
Lead spacing 5.0 mm (∅ d = 8 mm)

Last 3 digits of ordering code: 008



Lead spacing 5.0 mm (∅ d = 10 ... 12.5 mm)

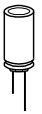
Last 3 digits of ordering code: 008



Dimensions in mm

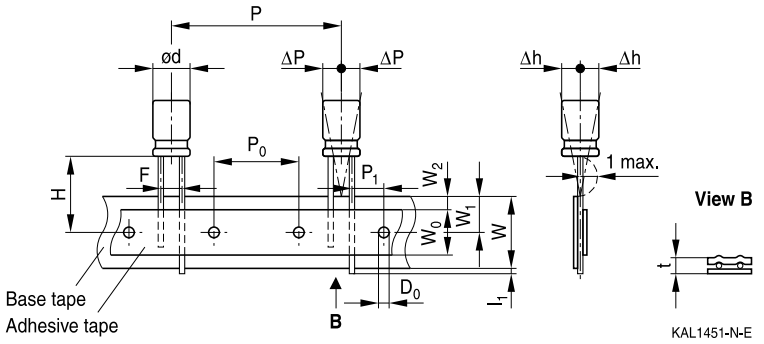
∅ d	F	H	W	W_0	W_1	W_2	H_0	P	P_0	P_1	l_1	t	Δh	D_0
4 ... 6.3	5.0	18.5	18.0	5.5	9.0	1.5	16.0	12.7	12.7	3.85	1.0	0.6	1.0	4.0
8	5.0	20.0	18.0	9.5	9.0	1.5	16.0	12.7	12.7	3.85	1.0	0.6	1.0	4.0
10		19.0		9.5			–	12.7	12.7	3.85				
12.5		19.0		11.5			–	15.0	15.0	5.0				
Tolerance	+0.8 −0.2	±0.75	±0.5	min.	±0.5	max.	±0.5	±1.0	±0.2	±0.5	max.	+0.3 −0.2	max.	±0.2

Taping is available up to dimensions d × l = 12.5 × 25 mm.



Lead spacing 7.5 mm (∅ d = 16 ...18 mm)

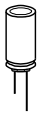
Last 3 digits of ordering code: 009



Dimensions in mm

∅ d	F	H	W	W_0	W_1	W_2	P	P_0	P_1	l_1	t	ΔP	Δh	D_0
16	7.5	18.5	18.0	12.5	9.0	1.5	30.0	15.0	3.75	1.0	0.7	0	0	4.0
18														
Tolerance	±0.8	−0.5 +0.75	±0.5	min.	±0.5	max.	±1.0	±0.2	±0.5	max.	±0.2	±1.0	±1.0	±0.2

Taping is available up to dimensions d × l = 16 × 31.5 mm and 18 × 31.5 mm.



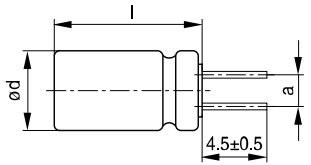
Cut or kinked leads

Single-ended capacitors are available with cut or kinked leads. Other lead configurations also available upon request.

Cut leads

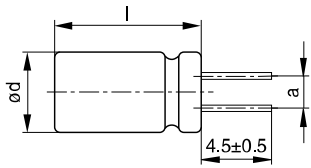
Last 3 digits of ordering code: 002

With stand-off rubber seal



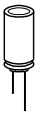
KAL1085-I

With flat rubber seal



KAL1086-R

Case size d × l (mm)	Dimensions (mm) a ±0.5
10 × 12.5	5.0
10 × 16	5.0
10 × 20	5.0
12.5 × 20	5.0
12.5 × 25	5.0
16 × 20	7.5
16 × 25	7.5
16 × 31.5	7.5
16 × 35.5	7.5
18 × 20	7.5
18 × 25	7.5
18 × 31.5	7.5
18 × 35	7.5
18 × 40	7.5



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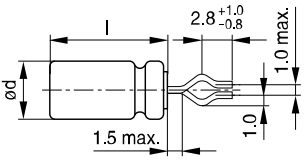
Up to 135 °C

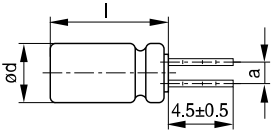
Kinked leads

Last 3 digits of ordering code: 001

With stand-off rubber seal

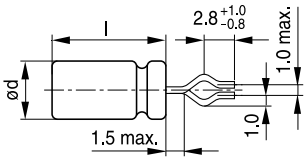


KAL1081-K

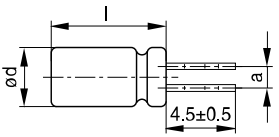


KAL1083-2

With flat rubber seal

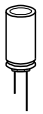


KAL1082-T



KAL1084-A

Case size d × l (mm)	Dimensions (mm) a ±0.5
10 × 20	5.0
12.5 × 20	5.0
12.5 × 25	5.0
16 × 20	7.5
16 × 25	7.5
16 × 31.5	7.5
16 × 35.5	7.5
18 × 20	7.5
18 × 25	7.5
18 × 31.5	7.5
18 × 35	7.5
18 × 40	7.5

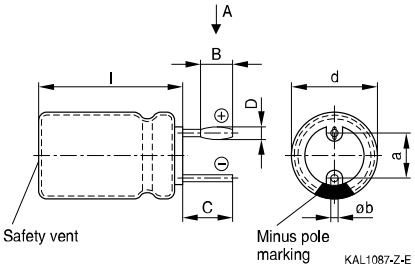


PAPR leads (Protection Against Polarity Reversal)

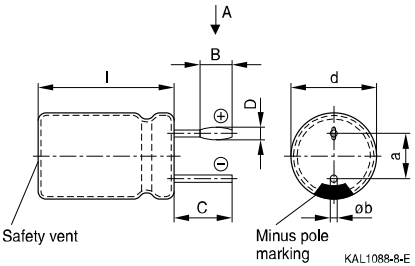
These lead configurations ensure correct placement of the capacitor on the PCB with regard to polarity. PAPR leads are available for diameters from 10 mm up to 18 mm (excluding d × l = 12.5 × 30/35/40 mm).
There are three configurations available: Crimped leads, J leads, bent 90° leads

Crimped leads
Last 3 digits of ordering code: 003

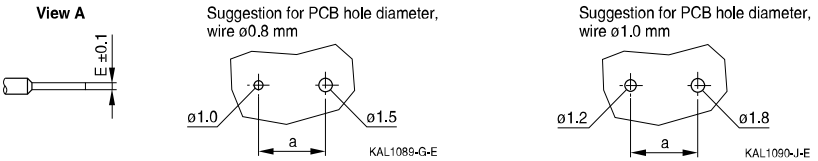
With stand-off rubber seal



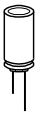
With flat rubber seal



Suggestion for PCB hole diameter



Case size	Dimensions (mm)					
d × l (mm)	B ±0.2	C ±0.5	D ±0.1	E ±0.1	a ±0.5	∅b
16 × 20	1.5	3.0	1.3	0.3	7.5	0.8 ±0.05
16 × 25	1.5	3.0	1.3	0.3	7.5	0.8 ±0.05
16 × 31.5	1.5	3.0	1.3	0.3	7.5	0.8 ±0.05
16 × 35.5	1.5	3.0	1.3	0.3	7.5	0.8 ±0.05
18 × 20	1.5	3.0	1.3	0.3	7.5	0.8 ±0.1
18 × 25	1.5	3.0	1.3	0.3	7.5	0.8 ±0.1
18 × 31.5	1.5	3.0	1.3	0.3	7.5	0.8 ±0.1
18 × 35	1.5	3.0	1.3	0.3	7.5	0.8 ±0.1
18 × 40	1.5	3.0	1.3	0.3	7.5	0.8 ±0.1

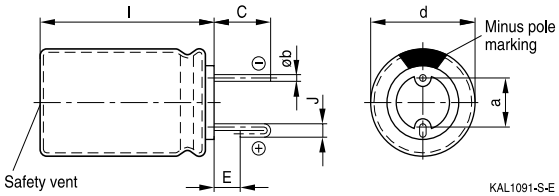


B41896

Up to 135 °C

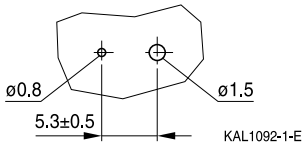
J leads

Last 3 digits of ordering code: 004

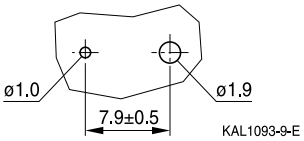


Suggestion for PCB hole diameter

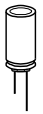
Suggestion for PCB hole diameter, wire ø0.6 mm



Suggestion for PCB hole diameter, wire ø0.8 mm

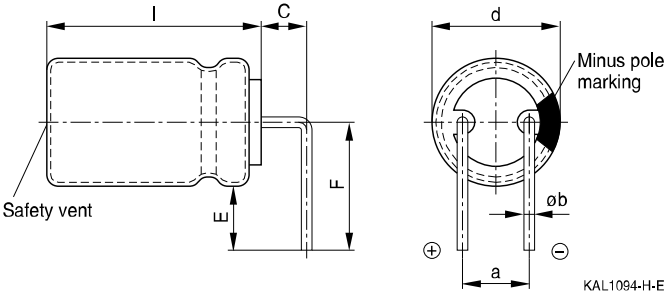


Case size	Dimensions (mm)				
d × l (mm)	C ±0.5	E ±0.5	J ±0.2	a ±0.5	∅b
10 × 12.5	3.2	0.7	1.2	5.0	0.6 ±0.05
10 × 16	3.2	0.7	1.2	5.0	0.6 ±0.05
10 × 20	3.2	0.7	1.2	5.0	0.6 ±0.05
12.5 × 20	3.2	0.7	1.2	5.0	0.6 ±0.05
12.5 × 25	3.2	0.7	1.2	5.0	0.6 ±0.05
16 × 20	3.5	0.7	1.6	7.5	0.8 ±0.05
16 × 25	3.5	0.7	1.6	7.5	0.8 ±0.05
16 × 31.5	3.5	0.7	1.6	7.5	0.8 ±0.05
16 × 35.5	3.5	0.7	1.6	7.5	0.8 ±0.05
18 × 20	3.5	0.7	1.6	7.5	0.8 ±0.1
18 × 25	3.5	0.7	1.6	7.5	0.8 ±0.1
18 × 31.5	3.5	0.7	1.6	7.5	0.8 ±0.1
18 × 35	3.5	0.7	1.6	7.5	0.8 ±0.1



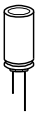
Bent 90° leads for horizontal mounting pinning

Last 3 digits of ordering code: 012



Case size	Dimensions (mm)				
d × l (mm)	C ±0.5	E ±0.5	F ±0.5	a ±0.5	∅b
16 × 20	4.0	4.0	12.0	7.5	0.8 ±0.05
16 × 25	4.0	4.0	12.0	7.5	0.8 ±0.05
16 × 31.5	4.0	4.0	12.0	7.5	0.8 ±0.05
16 × 35.5	4.0	4.0	12.0	7.5	0.8 ±0.05
18 × 20	4.0	4.0	13.0	7.5	0.8 ±0.1
18 × 25	4.0	4.0	13.0	7.5	0.8 ±0.1
18 × 31.5	4.0	4.0	13.0	7.5	0.8 ±0.1
18 × 35	4.0	4.0	13.0	7.5	0.8 ±0.1
18 × 40	4.0	4.0	13.0	7.5	0.8 ±0.1

Bent leads for diameter 12.5 mm available upon request.

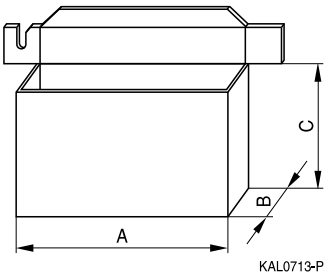


B41896

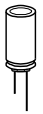
Up to 135 °C

Packing units and box dimensions

Ammo pack



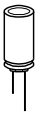
Case size d × l	Dimensions (mm)			Packing units
mm	A_{max}	B_{max}	C_{max}	pcs.
8 × 11.5	345	55	240	1000
10 × 12.5	345	55	280	750
10 × 16	345	60	200	500
10 × 20	345	60	200	500
12.5 × 20	345	65	280	500
12.5 × 25	345	65	280	500
16 × 20	315	65	275	300
16 × 25	315	65	275	300
16 × 31.5	315	65	275	300
18 × 20	315	65	275	250
18 × 25	315	65	275	250
18 × 31.5	315	65	275	250



Overview of packing units and code numbers for case sizes 8 × 11.5 ... 16 × 35.5

							PAPR		
Case size d × l mm	Stan-dard, bulk pcs.	Taped, Ammo pack pcs.			Kinked leads, bulk pcs.	Cut leads, bulk pcs.	Crimped leads, blister pcs.	J leads, blister pcs.	Bent 90° leads, blister pcs.
8 × 11.5	1000	1000			–	–	–	–	
10 × 12.5	1000	750			–	1000	–	675	
10 × 16	1000	500			–	1000	–	675	
10 × 20	500	500			500	500	–	500	
12.5 × 20	350	500			350	350	–	300	1)
12.5 × 25	250	500			500	500	–	225	1)
12.5 × 30	200	–			–	–	–	–	
12.5 × 35	175	–			–	–	–	–	
12.5 × 40	175	–			–	–	–	–	
16 × 20	250	300			200	200	200	200	120
16 × 25	250	300			200	200	200	200	216
16 × 31.5	200	300			250	250	344	344	180
16 × 35.5	100	–			100	100	150	150	150
The last three digits of the complete ordering code state the lead configuration	**000**	Code	F (mm)	d (mm)	**001**	**002**	**003**	**004**	**012**
		006	3.5	8					
		008	5	8...12.5					
		009	7.5	16...18					

1) Available upon request



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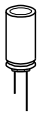
Up to 135 °C

Overview of packing units and code numbers for case sizes 18 × 20 ... 18 × 40

							PAPR		
Case size d × l	Stan-dard, bulk	Taped, Ammo pack			Kinked leads, bulk	Cut leads, bulk	Crimped leads, blister	J leads, blister	Bent 90° leads, blister
mm	pcs.	pcs.			pcs.	pcs.	pcs.	pcs.	pcs.
18 × 20	175	250			175	175	200	200	120
18 × 25	150	250			150	150	200	200	120
18 × 31.5	100	250			100	100	150	150	120
18 × 35	100	–			100	100	150	150	150
18 × 40	125	–			100	100	120	–	72
The last three digits of the complete ordering code state the lead configuration	**000**	Code	F (mm)	d (mm)	**001**	**002**	**003**	**004**	**012**
		009	7.5	16...18					



Cautions and warnings

Personal safety

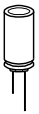
The electrolytes used by EPCOS have been optimized both with a view to the intended application and with regard to health and environmental compatibility. They do not contain any solvents that are detrimental to health, e.g. dimethyl formamide (DMF) or dimethyl acetamide (DMAC).
Furthermore, some of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



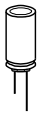
B41896

Up to 135 °C

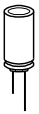
Product safety

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 polarity classes should be prevented by connecting a diode.	3.1.6 "Reverse voltage"
Mounting position of screw-terminal capacitors	Do not mount the capacitor with the terminals (safety vent) upside down.	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, such as fire or electricity.	8.1 "Passive flammability"

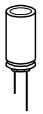


Topic	Safety information	Reference chapter "General technical information"
Active flammability	Avoid overload of the capacitors.	8.2 "Active flammability"
Maintenance	Make periodic inspections of the capacitors. Before the inspection, make sure that the power supply is turned off and carefully discharge the electricity of the capacitors. Do not apply any mechanical stress to the capacitor terminals.	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 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"



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
$I_{AC,R}$ (B)	Rated ripple current for base cooling	Nennwechselstromstrom für Bodenkühlung
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 Becherbodens
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.**
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