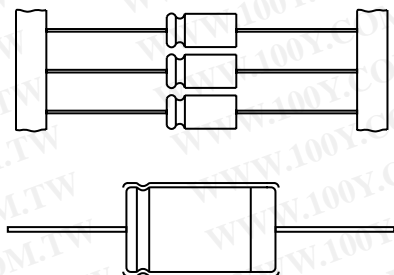




## Aluminum Capacitors Axial Capacitor Style

勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-34970699  
 勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)



Component outlines

### FEATURES

- Polarized aluminum electrolytic capacitors
- High CU product
- Miniature size
- Charge/discharge proof
- High ripple current capability
- Compliant to RoHS directive 2002/95/EC



**RoHS**  
COMPLIANT

### APPLICATIONS

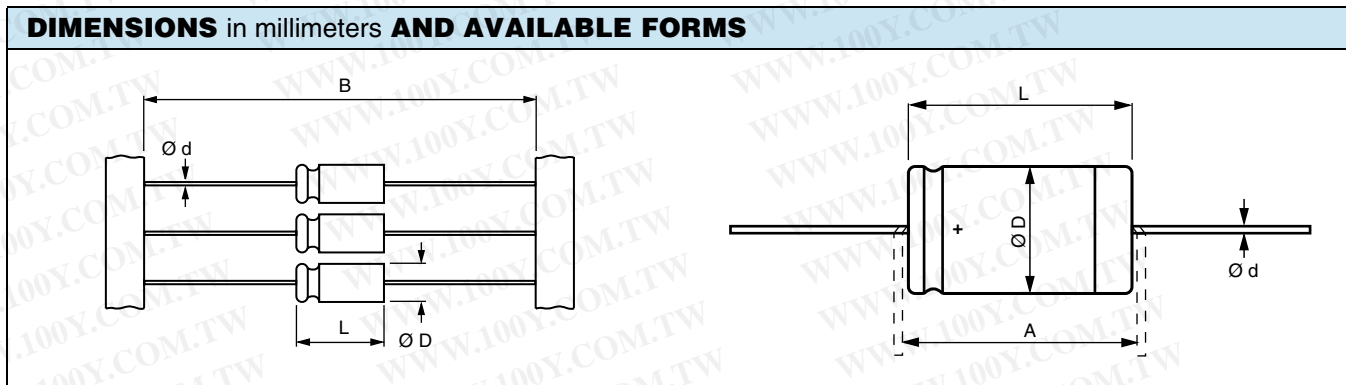
- General purpose, industrial electronics, audio/video systems
- Coupling, smoothing, filtering, buffering and timing
- Portable and mobile units
- Vibration and shock resistant

### QUICK REFERENCE DATA

DESCRIPTION	UNIT	LOW VOLTAGE	
Nominal case size (Ø D x L)	mm	4.5 x 10	6 x 10 to 10 x 25
Rated capacitance range C <sub>R</sub>	µF	1.0 to 2200	
Capacitance tolerance	%	± 20	
Rated voltage range	V	6.3 to 100	
Category temperature range	°C	- 40 to + 85	
Endurance test at upper category temp.	h	1000	
Useful life at 105 °C and I <sub>R</sub> applied	h	500	750
Useful life at 85 °C and I <sub>R</sub> applied	h	2500	
Useful life at 40 °C and I <sub>R</sub> applied	h	70 000	
Shelf life at (0 V, upper category temperature)	h	500	
Failure rate (0.8 U <sub>R</sub> , 40 °C)	10 <sup>-9</sup> /h	≤ 130	
Based on sectional specification		IEC 60384-4/EN 130300	
Based on detailed specifications		similar to CECC 30301-044, similar to DIN 45910 Part 126, without quality assessment	
Climatic category IEC 68068		40/085/56 GPF	

### SELECTION CHART FOR C<sub>R</sub>, U<sub>R</sub> > 100 V AND RELEVANT NOMINAL CASE SIZES (Ø D x L in mm)

C <sub>R</sub> (µF)	U <sub>R</sub> (V)							
	6.3	10	16	25	40	50	63	100
1.0	→	→	→	→	→	→	→	4.5 x 11
2.2	→	→	→	→	→	→	→	4.5 x 11
4.7	→	→	→	→	→	→	→	4.5 x 11
10	→	<b>ELM</b>	→	→	→	→	4.5 x 11	6 x 10
22	→	→	→	→	4.5 x 11	→	6 x 10	6.5 x 18
33	→	→	→	4.5 x 11	-	-	-	-
47	→	→	→	4.5 x 11	6 x 10	→	6.5 x 18	8 x 18
100	→	4.5 x 11	→	6 x 10	6.5 x 18	→	8 x 18	10 x 25
220	→	6 x 10	→	6.5 x 18	10 x 18	<b>EBM</b>	10 x 25	-
470	→	6.5 x 18	8 x 18	10 x 18	10 x 25	-	-	-
680	→	8 x 18	10 x 18	10 x 25	-	-	-	-
1000	8 x 18	10 x 18	10 x 25	-	-	-	-	-
1500	10 x 18	10 x 25	-	-	-	-	-	-
2200	10 x 25	-	-	-	-	-	-	-



**AXIAL STYLE: DIMENSIONS** in millimeters, **MASS, PACKAGING QUANTITIES AND ORDERING CODE**

NOMINAL CASE SIZE $\varnothing D \times L$	$\varnothing d$	$\varnothing D_{max.}$	$L_{max.}$	$A_{min.}$	B	MASS APPROX. g	PACKAGING, ENDING OF ORDERING CODE, QUANTITIES			
							TAPED ON REEL		TAPED AMMO	
							CODE	PCS.	CODE	PCS.
4.5 x 11	0.6	5	11.0	15	63.5 ± 1.5	0.5	..A0W	3000	..B0W	1000
6 x 10	0.6	6.3	10.5	15	63.5 ± 1.5	0.7	..A0W	1000	..B0W	1000
6.5 x 18	0.8	6.9	18.5	25	73.0 ± 1.6	1.3	..A0W	1000	..B0W	1000
8 x 18	0.8	8.5	18.5	25	73.0 ± 1.6	1.7	..A0W	500	..B0W	500
10 x 18	0.8	10.5	18.5	25	73.0 ± 1.6	2.5	..A0W	500	..B0W	500
10 x 25	0.8	10.5	25.0	30	73.0 ± 1.6	3.3	..A0W	500	..B0W	500

Axial style capacitors are insulated.

**ELECTRICAL DATA**

SYMBOL	DESCRIPTION
$U_R$	rated voltage
$C_R$	rated capacitance at 100 Hz
$\tan \delta$	max. dissipation factor at 100 Hz
$R_{ESR}$	equivalent series resistance at 100 Hz, (calculated from $\tan \delta_{max.}$ and $C_R$ )
Z	max. impedance at 10 kHz
$I_R$	rated alternating current (rms) at 100 Hz and upper category temperature
$T_a$	ambient temperature
$T_{uc}$	upper category temperature
RH	relative humidity
P	ambient pressure

**Note**

Unless otherwise specified, all electrical values apply at  $T_a = 20\text{ }^\circ\text{C}$ ,  $P = 80\text{ kPa}$  to  $106\text{ kPa}$ ,  $RH = 45\%$  to  $75\%$ .

**ORDERING EXAMPLE**

The following table gives the ordering number.

The 16<sup>th</sup> place of ordering code refers to packaging for axial lead capacitors:

MALAEBM00GD422B...	EBM 2200 $\mu\text{F}$ 6.3 V 10 x 25
MALAEBM00GD422BA0W	A = taped on reel
MALAEBM00GD422BB0W	B = taped ammo

Please see table "Axial Styles" for available versions.


 Aluminum Capacitors  
 Axial Capacitor Style

Vishay Roederstein

ELECTRICAL DATA AND ORDERING INFORMATION							
$U_R$ (V)	$C_R$ 100 Hz ( $\mu$ F)	NOMINAL CASE SIZE $\varnothing$ D x L (mm)	$\tan \delta$ 100 Hz MAX.	$R_{ESR}$ 100 Hz ( $\Omega$ )	Z 10 kHz MAX. ( $\Omega$ )	$I_R$ 100 Hz $T_{uc}$ (A)	CATALOG NUMBER MALA...
6.3	1000	8 x 18	0.25	0.400	0.500	0.44	EBM00FL410BB0W
	1500	10 x 18	0.25	0.270	0.320	0.56	EBM00GL415BB0W
	2200	10 x 25	0.29	0.210	0.160	0.71	EBM00GD422BB0W
10	100	4.5 x 11	0.20	3.200	2.000	0.10	ELM00BA310CB0W
	220	6 x 10	0.20	1.500	0.910	0.16	EBM00CK322CB0W
	470	6.5 x 18	0.20	0.680	0.430	0.31	EBM00DL347CB0W
	680	8 x 18	0.20	0.470	0.290	0.40	EBM00FL368CB0W
	1000	10 x 18	0.20	0.320	0.200	0.55	EBM00GL410CB0W
	1500	10 x 25	0.23	0.250	0.180	0.69	EBM00GD415CB0W
16	470	8 x 18	0.16	0.550	0.340	0.38	EBM00FL347DB0W
	680	10 x 18	0.16	0.380	0.240	0.50	EBM00GL368DB0W
	1000	10 x 25	0.16	0.260	0.180	0.66	EBM00GD410DB0W
25	33	4.5 x 11	0.14	6.700	3.500	0.07	ELM00BA233EB0W
	47	4.5 x 11	0.14	4.800	2.600	0.08	ELM00BA247EB0W
	100	6 x 10	0.14	2.300	1.200	0.15	EBM00CK310EB0W
	220	6.5 x 18	0.14	1.000	0.550	0.25	EBM00DL322EB0W
	470	10 x 18	0.14	0.480	0.260	0.45	EBM00GL347EB0W
	680	10 x 25	0.14	0.330	0.180	0.56	EBM00GD368EB0W
40	22	4.5 x 11	0.11	8.000	3.200	0.06	ELM00BA222GB0W
	47	6 x 10	0.11	3.800	1.500	0.11	EBM00CK247GB0W
	100	6.5 x 18	0.11	1.800	0.700	0.19	EBM00DL310GB0W
	220	10 x 18	0.11	0.800	0.320	0.33	EBM00GL322GB0W
	470	10 x 25	0.11	0.370	0.160	0.52	EBM00GD347GB0W
63	10	4.5 x 11	0.08	13.000	5.500	0.05	ELM00BA210JB0W
	22	6 x 10	0.08	5.800	2.500	0.09	EBM00CK222JB0W
	47	6.5 x 18	0.08	2.700	1.200	0.15	EBM00DL247JB0W
	100	8 x 18	0.08	1.300	0.550	0.25	EBM00FL310JB0W
	220	10 x 25	0.08	0.600	0.250	0.43	EBM00GD322JB0W
100	1.0	4.5 x 11	0.08	130.000	90.000	0.01	ELM00BA110LB0W
	2.2	4.5 x 11	0.08	58.000	41.000	0.02	ELM00BA122LB0W
	4.7	4.5 x 11	0.08	27.000	19.000	0.03	ELM00BA147LB0W
	10	6 x 10	0.08	13.000	9.000	0.07	EBM00CK210LB0W
	22	6.5 x 18	0.08	5.800	4.100	0.10	EBM00DL222LB0W
	47	8 x 18	0.08	2.700	1.900	0.16	EBM00FL247LB0W
	100	10 x 25	0.08	1.300	0.900	0.30	EBM00GD310LB0W

ADDITIONAL ELECTRICAL DATA		
PARAMETER	CONDITIONS	VALUE
<b>Voltage</b>		
Surge voltage	$U_R \leq 100$ V	$U_s = 1.15 \times U_R$
Reverse voltage	-	$U_{rev} \leq 1$ V
<b>Current</b>		
Leakage current	$U_R \leq 100$ V $U_R, 300$ s	$I_L/\mu A \leq 0.002 \times C_R/\mu F \times U_R/V + 3$



**LOW TEMPERATURE BEHAVIOUR**

Table for the calculation of the maximum 10 kHz impedance at low temperatures:

$$Z(10\text{ kHz}) [\Omega] = \frac{\text{Tabular value}}{C_R [\mu\text{F}]}$$

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[Http://www.100y.com.tw](http://www.100y.com.tw)

T <sub>a</sub> (°C)	RATED VOLTAGE (V)							
	6.3	10	16	25	40	50	63	100
- 25	2100	1600	1250	680	390	375	240	200
- 40	7600	5700	3500	1870	1150	1100	650	500

In practical operation the lower limit of the series resistance and impedance is given by the ohmic part of the contact points and the foil resistance values. Therefore it will not always be possible to achieve calculated values below 0.05 Ω.

**LIFETIME TABLE** U<sub>R</sub> ≤ 100 V

<b>INTERRELATION BETWEEN ALTERNATING CURRENT, AMBIENT TEMPERATURE AND LIFETIME</b>																				
I/I <sub>R</sub> (FREQUENCY DEPENDENT)							LIFETIME MULTIPLIER L (depending on I/I <sub>R</sub> and T <sub>a</sub> )													
FREQUENCY [Hz]							AMBIENT TEMPERATURE T <sub>a</sub> [°C]													
50	100	250	500	1000	> 2500	10 K	40	45	50	55	60	65	70	75	80	85	90	95	100	105
0	0	0	0	0	0	0	56	35	23	15	9.7	6.4	4.3	3.0	2.0	1.42	1.00	0.71	0.51	0.37
0.18	0.20	0.22	0.23	0.24	0.25	0.26	54	34	22	14	9.4	6.3	4.2	2.9	2.0	1.40	0.98	0.70	0.50	0.36
0.36	0.40	0.44	0.46	0.48	0.50	0.52	49	31	20	13	8.8	5.9	4.0	2.7	1.9	1.33	0.94	0.67	0.48	0.35
0.54	0.60	0.66	0.69	0.72	0.75	0.78	43	28	18	12	8.0	5.4	3.7	2.5	1.8	1.24	0.88	0.63	0.45	0.33
0.72	0.80	0.88	0.92	0.96	1.00	1.04	36	24	16	10	7.0	4.8	3.3	2.3	1.6	1.13	0.80	0.58	0.42	0.31
0.90	1.00	1.10	1.15	1.20	1.25	1.30	29	19	13	8.8	6.0	4.1	2.9	2.0	1.4	1.00	0.72	0.52	0.38	0.28
1.08	1.20	1.32	1.38	1.44	1.50	1.56	23	16	11	7.3	5.0	3.5	2.4	1.7	1.2	0.88	0.63	0.46	0.34	
1.26	1.40	1.54	1.61	1.68	1.75	1.82	18	12	8.5	5.9	4.1	2.9	2.0	1.5	1.0	0.75	0.55	0.40	0.29	
1.44	1.60	1.76	1.84	1.92	2.00	2.08	13	9.4	6.6	4.7	3.3	2.3	1.7	1.2	0.87	0.64	0.47	0.34		
1.62	1.80	1.98	2.07	2.16	2.25	2.34	10	7.1	5.1	3.6	2.6	1.9	1.4	1.0	0.72	0.53	0.39	0.29		
1.80	2.00	2.20	2.30	2.40	2.50	2.60	7.3	5.3	3.8	2.8	2.0	1.5	1.1	0.80	0.59	0.43	0.32			
1.98	2.20	2.42	2.53	2.64	2.75	2.86	5.3	3.9	2.9	2.1	1.6	1.2	0.85	0.63	0.47	0.35				
2.16	2.40	2.64	2.76	2.88	3.00	3.12	3.8	2.8	2.1	1.6	1.2	0.89	0.66	0.50	0.37	0.28				
2.34	2.60	2.86	2.99	3.12	3.25	3.38	2.7	2.1	1.6	1.2	0.89	0.67	0.51	0.39	0.29					
2.52	2.80	3.08	3.22	3.36	3.50	3.64	1.9	1.5	1.1	0.87	0.67	0.51	0.39	0.30						
2.70	3.00	3.30	3.45	3.60	3.75	3.90	1.4	1.1	0.82	0.64	0.49	0.38	0.30							
2.88	3.20	3.52	3.68	3.84	4.00	4.16	0.95	0.75	0.59	0.46	0.36	0.28								
3.06	3.40	3.74	3.91	4.08	4.25	4.42	0.66	0.53	0.42	0.34										
3.24	3.60	3.96	4.14	4.32	4.50	4.68	0.46	0.37												
3.42	3.80	4.18	4.37	4.56	4.75	4.94	0.32													

I<sub>R</sub> 100 Hz alternating current [A] at upper category temperature T<sub>UC</sub> taken from data sheet

I User current [A]

T<sub>a</sub> Ambient temperature of capacitor [°C]

L Lifetime multiplier

Regard L as a function of ambient temperature (x-axis) and of current (y-axis); use the current-axis according to the frequency


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 Axial Capacitor Style

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TEST PROCEDURES AND REQUIREMENTS			
TEST		PROCEDURE (quick reference)	REQUIREMENTS
NAME OF TEST	REFERENCE		
Endurance	IEC 60384-4/ EN 130300 subclause 4.13	$T_A =$ upper cat. temp.; $U_R$ applied $6.3\text{ V} \leq U_R \leq 100\text{ V}$ : 1000 h  $T_A = 85\text{ }^\circ\text{C}$ ; $U_R$ applied	$U_R = 6.3\text{ V}$ : $-40\% \leq \Delta C/C \leq 25\%$ $U_R > 6.3\text{ V}$ : $-30\% \leq \Delta C/C \leq 30\%$ $\tan \delta \leq 1.5 \times \text{spec. limit}$  $Z \leq 3 \times \text{spec. limit}$ $I_L (300\text{ s}) \leq \text{spec. limit}$
Useful life	CECC 30301 subclause 1.8.1	$T_A = 105\text{ }^\circ\text{C}$ ; $U_R$ and $I_R$ applied; $6.3\text{ V} \leq U_R \leq 100\text{ V}$ Cases 4.5 x 11: 500 h Cases 6 x 10 to 10 x 25: 750 h $T_A = 85\text{ }^\circ\text{C}$ ; $U_R$ and $I_R$ applied	$U_R = 6.3\text{ V}$ : $-50\% \leq \Delta C/C \leq 45\%$ $U_R > 6.3\text{ V}$ : $-45\% \leq \Delta C/C \leq 45\%$ $\tan \delta \leq 3 \times \text{spec. limit}$ $Z \leq 3 \times \text{spec. limit}$ $I_L (300\text{ s}) \leq \text{spec. limit}$ No short circuit, no open circuit  Total failure percentage: $\leq 1\%$
Shelf life (storage at high temperature)	IEC 60384-4/ EN 130300 subclause 4.17	$T_A =$ upper cat. temp.; no voltage applied $6.3\text{ V} \leq U_R \leq 100\text{ V}$ Cases 4.5 x 11 to 10 x 25: 500 h  After test: $U_R$ to be applied for 30 minutes 24 hours to 48 hours before measurement	$U_R = 6.3\text{ V}$ : $-40\% \leq \Delta C/C \leq 25\%$ $U_R > 6.3\text{ V}$ : $-30\% \leq \Delta C/C \leq 30\%$ $\tan \delta \leq 1.5 \times \text{spec. limit}$  $Z \leq 3 \times \text{spec. limit}$ $I_L (300\text{ s}) \leq 2 \times \text{spec. limit}$



## Disclaimer

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