Aluminum Electrolytic Capacitors
Axial High Temperature High Voltage for E.L.B.

Fig. 1

QUICK REFERENCE DATA	
DESCRIPTION	**VALUE**
Nominal case sizes (Ø D x L in mm)	12.5 x 30 to 18 x 38
Rated capacitance range, C_R	6.8 µF to 33 µF
Tolerance on C_R	-10 % to +50 %
Rated voltage, U_R	450 V
Category temperature range	-25 °C to +105 °C
Endurance test at 105 °C	5000 h
Useful life at 105 °C	10 000 h
Useful life at 85 °C I_R applied	100 000 h
Shelf life at 0 V, 105 °C	500 h
Based on sectional specification	IEC 60384-4 / EN 130300
Climatic category IEC 60068	25 / 105 / 56

FEATURES

Pb-free
RoHS
COMPLIANT

- Useful life: 10 000 h at 105 °C
- Stable under overvoltage conditions: 550 V for 24 h at 85 °C
- High ripple current capability
- Smallest dimensions
- Taped versions up to case Ø 15 mm x 30 mm available for automatic insertion
- Polarized aluminum electrolytic capacitors, non-solid electrolyte
- Axial leads, cylindrical aluminum case, insulated with a blue sleeve
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

APPLICATIONS

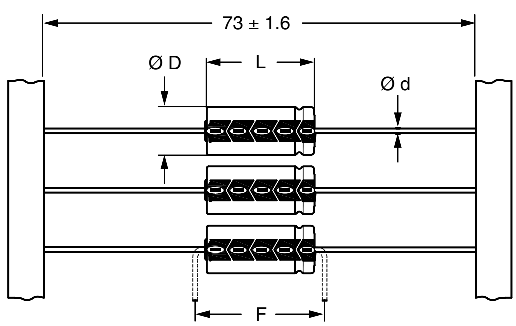
- Electronic lighting ballast, power supply
- Smoothing, filtering, buffering at high voltages
- Boards with restricted mounting height, vibration, and shock resistant

MARKING

The capacitors are marked (where possible) with the following information:

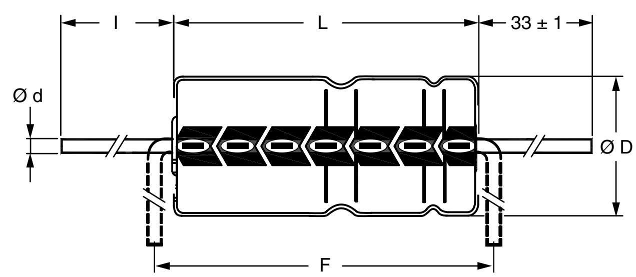
- Rated capacitance (in µF)
- Tolerance on rated capacitance, code letter in accordance with IEC 60062 (T for -10 % to +50 %)
- Rated voltage (in V)
- Upper category temperature (105 °C)
- Date code, in accordance with IEC 60062
- Code for factory of origin
- Name of manufacturer
- Negative terminal identification
- Series number (042 or 043)

DIMENSIONS in millimeters AND AVAILABLE FORMS



Form BR: Taped on reel
Case Ø D x L = 6.5 mm x 18 mm to 15 mm x 30 mm

Fig. 2 - **Form BR**



Form AA: Axial in box
Case Ø D x L = 10 mm x 30 mm to 21 mm x 38 mm

Fig. 3 - **Form AA**

For technical questions, contact: aluminumcaps1@vishay.com

Table 1

AXIAL; DIMENSIONS in millimeters, MASS AND PACKAGING QUANTITIES									
NOMINAL CASE SIZE Ø D x L	CASE CODE	AXIAL: FORM AA AND BR					MASS (g)	PACKAGING QUANTITIES	
		Ø D	L	Ø $D_{max.}$	$L_{max.}$	$F_{min.}$		FORM AA	FORM BR
12.5 x 30	01	0.8	55 ± 1	13.0	30.5	35	≈ 6.1	260	400
15 x 30	02	0.8	55 ± 1	15.5	30.5	35	≈ 8.3	200	250
18 x 30	03	0.8	55 ± 1	18.5	30.5	35	≈ 11.6	120	-
18 x 38	04	0.8	34 ± 1	18.5	39.5	44	≈ 16.0	125	-

Note

- For detailed tape dimensions please refer to packaging information: www.vishay.com/doc?28361

ELECTRICAL DATA	
SYMBOL	DESCRIPTION
C_R	Rated capacitance at 100 Hz, tolerance -10 % to+50 %
I_R	Rated RMS ripple current at 10 kHz, 105 °C
I_{L5}	Max. leakage current after 5 min at U_R
ESR	Typ. / max. equivalent series resistance at 100 Hz
Z	Typ. / max. impedance at 10 kHz

Note

- Unless otherwise specified, all electrical values in Table 2 apply at T_{amb} = 20 °C, P = 86 kPa to 106 kPa, RH = 45 % to 75 %.

ORDERING EXAMPLE

Electrolytic capacitor 042 series

10 µF / 450 V; -10 % / +50 %

Nominal case size: Ø 12.5 mm x 30 mm; Form BR

Ordering code: MAL204272109E3
Former 12NC: 2222 042 72109

Table 2

ELECTRICAL DATA AND ORDERING INFORMATION										
U_R (V)	C_R 100 Hz (µF)	NOMINAL CASE SIZE Ø D x L (mm)	I_R 10 kHz 105 °C (mA)	I_{L5} 5 min (µA)	ESR TYP. 100 Hz (Ω)	ESR MAX. 100 Hz (Ω)	Z TYP. 10 kHz (Ω)	Z MAX. 10 kHz (Ω)	ORDERING CODE MAL2.......... AXIAL IN BOX FORM AA	ORDERING CODE MAL2.......... AXIAL TAPED ON REEL FORM BR
450	6.8	12.5 x 30	390	106	4.2	8.7	3.1	5.1	04271688E3	04272688E3
	10	12.5 x 30	470	110	2.9	5.9	2.0	3.3	04271109E3	04272109E3
	15	15 x 30	600	115	1.9	3.9	1.3	2.3	04271159E3	04272159E3
	22	18 x 30	750	120	1.2	2.5	1.0	1.5	04271229E3	-
	33	18 x 38	1020	130	0.9	1.8	0.7	1.1	04371339E3	-

ADDITIONAL ELECTRICAL DATA		
PARAMETER	CONDITIONS	VALUE
Voltage		
Surge voltage	U_R = 450 V	$U_s \leq 550$ V
Overvoltage test	24 h at 85 °C	550 V (1)
Reverse voltage		$U_{rev} \leq 1$ V
Current		
Leakage current	After 1 min	$I_{L1} \leq 0.009 \times C_R \times U_R + 200$ µA
	After 5 min	$I_{L5} \leq 0.002 \times C_R \times U_R + 100$ µA
Inductance		
Equivalent series inductance	Case Ø D x L in mm:	
	12.5 x 30	Typ. 46 nH
	15 x 30	Typ. 48 nH
	18 x 30	Typ. 50 nH
	18 x 38	Typ. 54 nH

Note

(1) Test conditions on request.

CAPACITANCE (C)

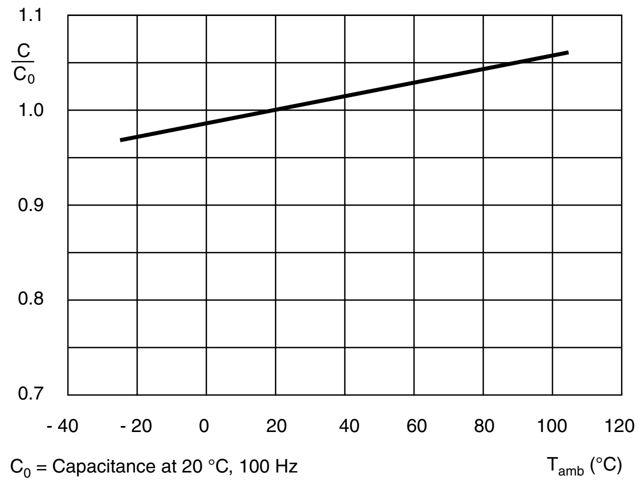


Fig. 4 - Typical multiplier of capacitance as a function of ambient temperature

EQUIVALENT SERIES RESISTANCE (ESR)

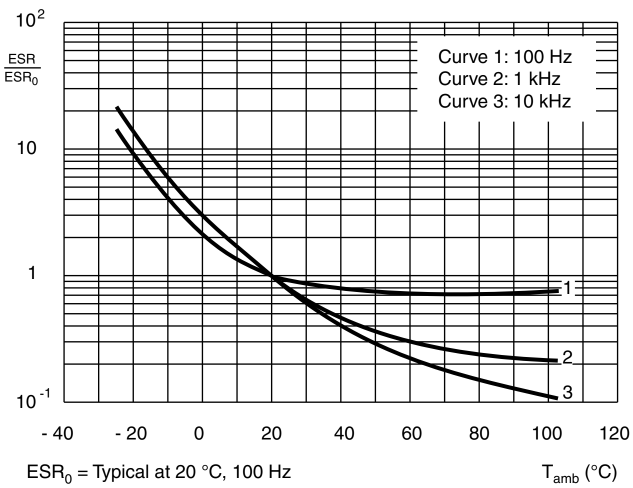


Fig. 5 - Typical multiplier of ESR as a function of ambient temperature at different frequencies

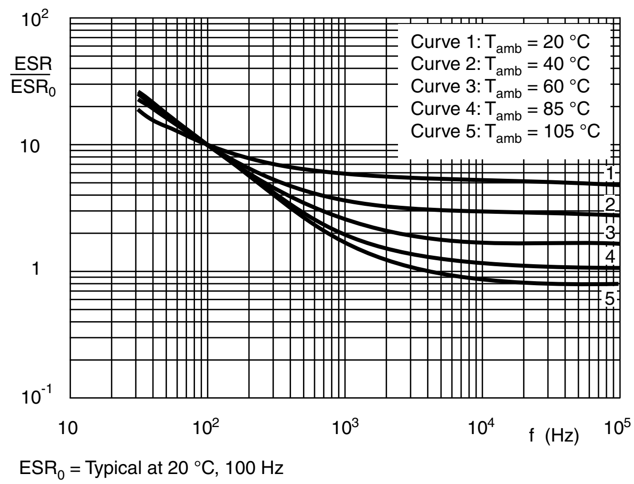


Fig. 6 - Typical multiplier of ESR as a function of frequency at different ambient temperatures

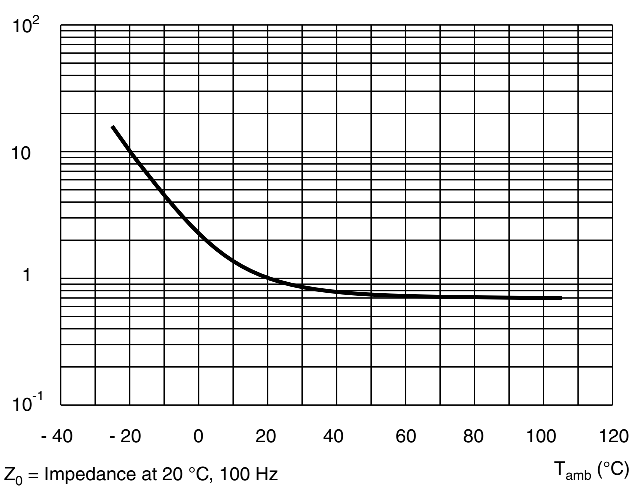


Fig. 7 - Typical multiplier of impedance as a function of ambient temperature

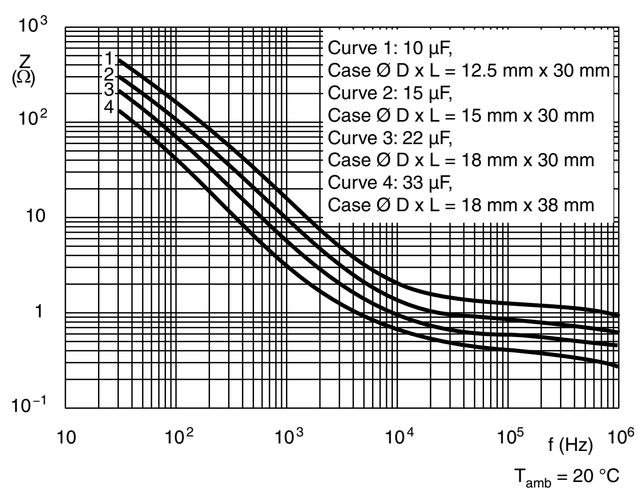


Fig. 8 - Typical impedance as a function of frequency

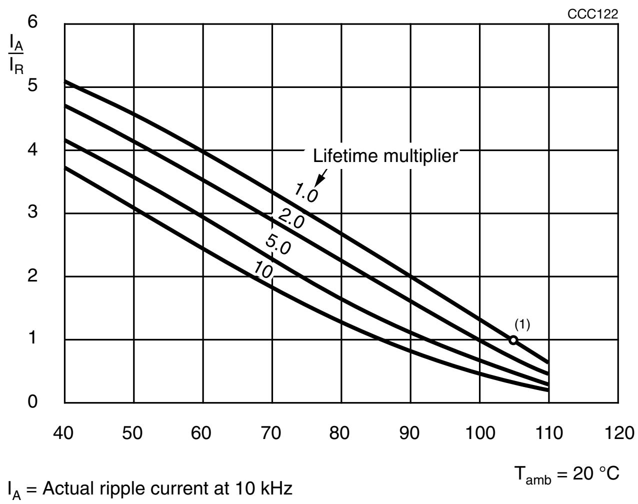
RIPPLE CURRENT AND USEFUL LIFE

Table 3

ENDURANCE TEST DURATION AND USEFUL LIFE	
ENDURANCE AT 105 °C (h)	**USEFUL LIFE AT 105 °C (h)**
5000	10 000

Note

- Multiplier of useful life code: CCC122



I_A = Actual ripple current at 10 kHz
I_R = Rated ripple current at 10 kHz, 105 °C
(1) Useful life at 105 °C and I_R applied: 10 000 h

Fig. 9 - Multiplier of useful life as a function of ambient temperature and ripple current load

Table 4

MULTIPLIER OF RIPPLE CURRENT (I_R) AS A FUNCTION OF FREQUENCY					
FREQUENCY (Hz)					
50	**100**	**300**	**1000**	**3000**	**≥ 10 000**
I_R MULTIPLIER					
0.20	0.27	0.45	0.68	0.82	1.00

Note

- Formula (1) should be used to calculate the actual ripple current at 10 kHz (see Fig. 9) when multiple frequencies are present. For an example of the values 100 Hz and 50 kHz:

$$I_A = \sqrt{\left(\frac{I(100\ Hz)}{0.27}\right)^2 + \left(\frac{I(50\ kHz)}{1.0}\right)^2} \qquad (1)$$

Table 5

TEST PROCEDURES AND REQUIREMENTS			
TEST		**PROCEDURE (quick reference)**	**REQUIREMENTS**
NAME OF TEST	**REFERENCE**		
Endurance	IEC 60384-4 / EN130300 subclause 4.13	T_{amb} = 105 °C; U_R applied; 5000 h	$\Delta C/C$: ± 10 % tan $\delta \leq$ 1.3 x spec. limit $Z \leq$ 2 x spec. limit $I_{L5} \leq$ spec. limit
Useful life	CECC 30301 subclause 1.8.1	T_{amb} = 105 °C; U_R and I_R applied; 10 000 h	$\Delta C/C$: ± 30 % tan $\delta \leq$ 3 x spec. limit $Z \leq$ 3 x spec. limit $I_{L5} \leq$ spec. limit No short or open circuit Total failure percentage: $\leq$ 3 %
Shelf life (storage at high temperature)	IEC 60384-4 / EN130300 subclause 4.17	T_{amb} = 105 °C; no voltage applied; 500 h After test: U_R to be applied for 30 min, 24 h to 48 h before measurement	$\Delta C/C$, tan δ, Z: For requirements see “Endurance test” above $I_{L5} \leq$ 2 x spec. limit

Statements about product lifetime are based on calculations and internal testing. They should only be interpreted as estimations. Also due to external factors, the lifetime in the field application may deviate from the calculated lifetime. In general, nothing stated herein shall be construed as a guarantee of durability.

For technical questions, contact: aluminumcaps1@vishay.com

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