

Aluminum Electrolytic Capacitors Power Ultra High Ripple Current Snap-In for Solar



FEATURES

- Long useful life: 6000 h at +105 °C
- Specified for 500 V, 50 °C operation
- High ripple current capability
- High reliability
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

APPLICATIONS

- Solar PV inverters
- Industrial motor control
- Power supply

MARKING

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

- Rated capacitance (in μF)
- Tolerance code on rated capacitance, code letter in accordance with IEC 60062 ($\pm 20\%$)
- Rated voltage (in V)
- Two digit date code, in accordance with IEC 60062
- Name of manufacturer
- Code for factory of origin
- “-” sign to identify the negative terminal, visible from the top and side of the capacitor
- Code number
- Climatic category in accordance with IEC 60068
- “LL” for long life grade



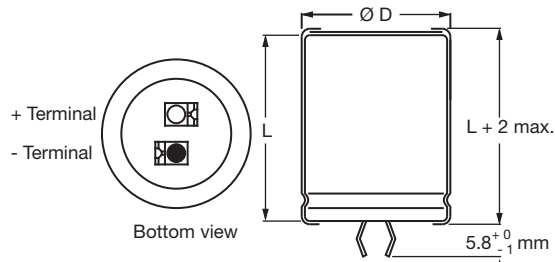
Fig. 1

QUICK REFERENCE DATA	
DESCRIPTION	VALUE
Nominal case size (D x L in mm)	35 x 30 to 35 x 60
Rated capacitance range, C_R	220 μF to 560 μF
Tolerance on C_R	$\pm 20\%$
Rated voltage, U_R	500 V
Rated temperature range	-40 °C to +50 °C
Category voltage, U_C	450 V
Category temperature range	-40 °C to +105 °C
Useful life at U_C , 105 °C, I_R applied	6000 h
Endurance at U_R , 50 °C, no ripple applied	5000 h
Shelf life at 0 V, 105 °C	1000 h
Based on sectional specification	IEC 60384-4 / EN130300
Climatic category IEC 60068	40 / 105 / 56

SELECTION CHART FOR C_R , U_R , AND RELEVANT NOMINAL CASE SIZES (\varnothing D x L in mm)					
C_R (μF)	U_R (V)				
	500				
220	35 x 30	-	-	-	-
330	-	35 x 40	-	-	-
390	-	-	35 x 45	-	-
470	-	-	-	35 x 50	-
560	-	-	-	-	35 x 60

DIMENSIONS in millimeters AND AVAILABLE FORMS

TWO TERMINAL SNAP-IN



The minus terminal can be marked with a black dot or with an imprinted “-” sign.

Fig. 2 - Two terminal snap-in

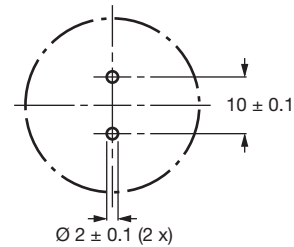


Fig. 3 - Mounting hole diagram

Table 1

DIMENSIONS in millimeters, MASS AND PACKAGING QUANTITIES					
NOMINAL CASE SIZE	Ø D _{max.}	L _{max.}	MASS (g)	PACKAGING QUANTITIES (unit per box)	CARDBOARD BOX DIMENSIONS L x W x H
35 x 30	36	32	40	50	390 x 198 x 44
35 x 40	36	42	56	50	390 x 198 x 54
35 x 45	36	47	64	50	390 x 198 x 59
35 x 50	36	52	72	50	390 x 198 x 64
35 x 60	36	62	88	50	390 x 198 x 74

Note

- Other case sizes, terminations and capacitance values available on request.

ELECTRICAL DATA	
SYMBOL	DESCRIPTION
C _R	Rated capacitance at 100 Hz
I _R	Rated RMS ripple current at 100 Hz and 105 °C
I _{L1}	Max. leakage current after 1 min at U _R
ESR	Max. equivalent series resistance at 100 Hz
Z	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 capacitors 470 µF / 500 V
 Nominal case size: Ø 35 mm x 50 mm
 Ordering code: MAL219390104E3

Table 2

ELECTRICAL DATA AND ORDERING INFORMATION								
U _R (V)	U _C (V)	C _R (µF)	CASE SIZE Ø D x L (mm)	I _R 100 Hz 105 °C (A) ⁽¹⁾	I _L 1 min (mA)	ESR 100 Hz MAX. (mΩ)	Z 10 kHz MAX. (mΩ)	ORDERING CODE
500	450	220	35 x 30	1.35	0.6	900	600	MAL219390101E3
		330	35 x 40	1.74	0.9	600	400	MAL219390102E3
		390	35 x 45	1.94	1.1	500	350	MAL219390103E3
		470	35 x 50	2.18	1.3	450	300	MAL219390104E3
		560	35 x 60	2.52	1.5	350	250	MAL219390105E3

Note

- ⁽¹⁾ At U_{max.} ≤ U_C



ADDITIONAL ELECTRICAL DATA		
PARAMETER	CONDITIONS	VALUE
Voltage		
Surge voltage		$U_s = 1.1 \times U_C$
Reverse voltage		$U_{rev} \leq 1 V$
Current		
Leakage current	After 1 min at U_R	$I_{L1} \leq 0.006 C_R \times U_C$
	After 5 min at U_R	$I_{L5} \leq 0.002 C_R \times U_C$
Inductance		
Equivalent series inductance (ESL)	All case sizes	ca. 20 nH

RIPPLE CURRENT AND USEFUL LIFE

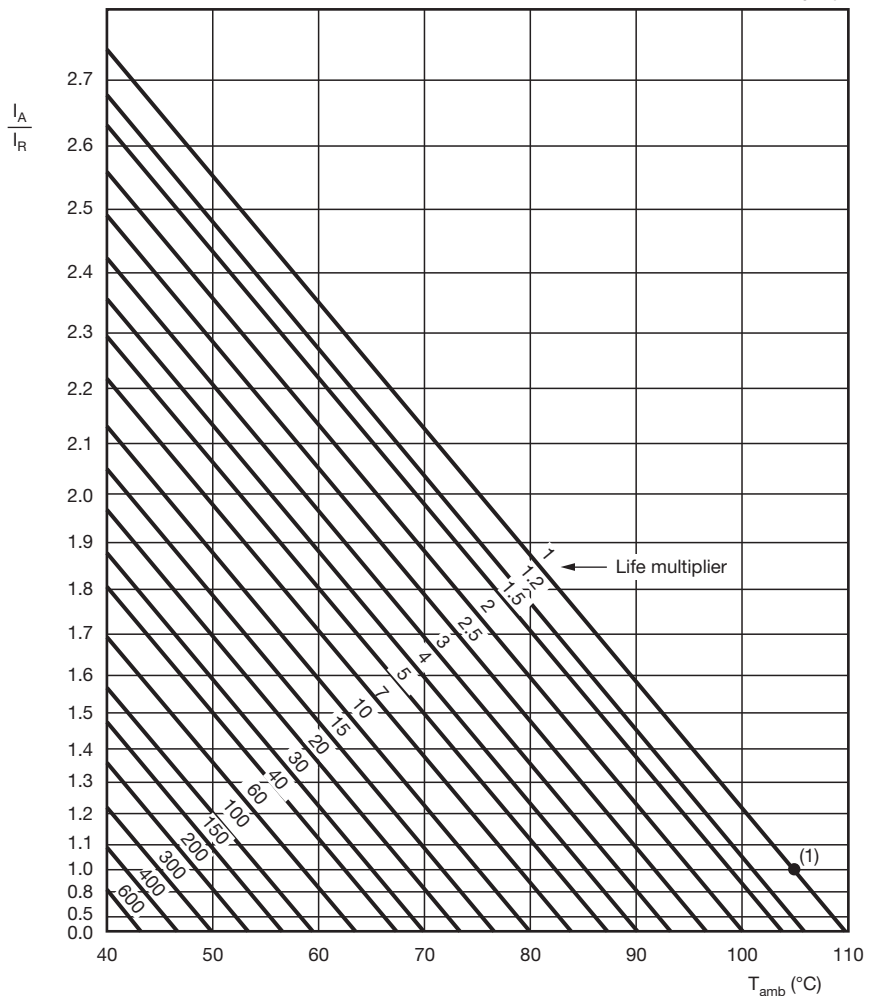
Table 3

ENDURANCE TEST DURATION AND USEFUL LIFE	
ENDURANCE AT 50 °C, 500 V (h)	USEFUL LIFE AT 105 °C, 450 V (h)
5000	6000

Note

- Multiplier of useful life code: MGA454

MGA454



I_A = Actual ripple current at 120 Hz
 I_R = Rated ripple current at 120 Hz and 105 °C
 (1) Useful life at 105 °C and I_R applied: 6000 h

Fig. 4 - 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	120	200	1000	$\geq 10\ 000$
I_R MULTIPLIER					
0.90	0.95	1.00	1.15	1.30	1.40

Table 5

TEST PROCEDURES AND REQUIREMENTS			
TEST		PROCEDURE (quick reference)	REQUIREMENTS
NAME OF TEST	REFERENCE		
Endurance	IEC 60384-4 / EN130301 subclause 4.13	$T_{amb} = 50\ ^\circ\text{C}$; $U_R = 500\ \text{V}$ applied; 5000 h	$\Delta C/C: \pm 15\ \%$ $ESR \leq 1.5 \times \text{spec. limit}$ $Z \leq 2 \times \text{spec. limit}$ $I_{L5} \leq \text{spec. limit}$
Useful life	EN130301 subclause 1.8.1	$T_{amb} = 105\ ^\circ\text{C}$; U_C and I_R applied; 6000 h	$\Delta C/C: \pm 30\ \%$ $ESR \leq 3 \times \text{spec. limit}$ $Z \leq 3 \times \text{spec. limit}$ $I_{L5} \leq \text{spec. limit}$ no short or open circuit, no visible damage total failure percentage $\leq 1\ \%$
Shelf life (storage at high temperature)	IEC 60384-4 / EN130300 subclause 4.17	$T_{amb} = 105\ ^\circ\text{C}$; no voltage applied; 1000 h after test: U_C to be applied for 30 min, 24 h to 48 h before measurement	$\Delta C/C: \pm 15\ \%$ $ESR \leq 1.5 \times \text{spec. limit}$ $I_{L5} \leq 2 \times \text{spec. limit}$

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.



Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.