## Vishay BCcomponents

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



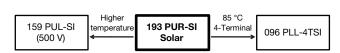


Fig. 1

QUICK REFERENCE DATA						
DESCRIPTION	VALUE					
Nominal case size (D x L in mm)	35 x 30 to 35 x 60					
Rated capacitance range, C <sub>R</sub>	220 μF to 560 μF					
Tolerance on C <sub>R</sub>	± 20 %					
Rated voltage, U <sub>R</sub>	500 V					
Rated temperature range	-40 °C to +50 °C					
Category voltage, U <sub>C</sub>	450 V					
Category temperature range	-40 °C to +105 °C					
Useful life at U <sub>C</sub> , 105 °C, I <sub>R</sub> applied	6000 h					
Endurance at U <sub>R</sub> , 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					

#### **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 <a href="https://www.vishay.com/doc?99912">www.vishay.com/doc?99912</a>

#### **APPLICATIONS**

- Solar PV inverters
- · Industrial motor control
- Power supply

#### **MARKING**

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

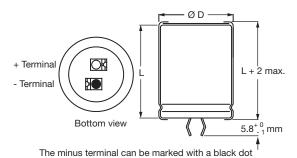
- Rated capacitance (in µF)
- Tolerance code on rated capacitance, code letter in accordance with IEC 60062 (± 20 %)
- Rated voltage (in V)
- Two digit date code, in accordance with IEC 60062
- · Name of manufacturer
- · Code for factory of origin
- "-" sign to identify the negative terminal, visible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

SELECTION CHART FOR $C_R$ , $U_R$ , and relevant nominal case sizes ( $\varnothing$ D x L in mm)					
C <sub>R</sub>	C <sub>B</sub> U <sub>R</sub> (V)				
(μ <b>F</b> )		500			
220	35 x 30	-	-	-	-
330	-	35 x 40	-	-	-
390	-	-	35 x 45	-	-
470	-	-	-	35 x 50	-
560	-	-	-	-	35 x 60

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#### **DIMENSIONS** in millimeters **AND AVAILABLE FORMS**

#### TWO TERMINAL SNAP-IN



or with an imprinted "-" sign. Fig. 2 - Two terminal snap-in

0 2 ± 0.1 (2 x)

Fig. 3 - Mounting hole diagram

#### Table 1

DIMENSIONS in millimeters, MASS AND PACKAGING QUANTITIES						
NOMINAL CASE SIZE	Ø D <sub>max.</sub>	L <sub>max.</sub>	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 <sub>R</sub>	Rated capacitance at 100 Hz				
I <sub>R</sub>	Rated RMS ripple current at 100 Hz and 105 °C				
I <sub>L1</sub>	Max. leakage current after 1 min at U <sub>R</sub>				
ESR	Max. equivalent series resistance at 100 Hz				
Z	Max. impedance at 10 kHz				

# ORDERING EXAMPLE

Electrolytic capacitors 470  $\mu$ F / 500 V Nominal case size: Ø 35 mm x 50 mm Ordering code: MAL219390104E3

#### Note

 Unless otherwise specified, all electrical values in Table 2 apply at T<sub>amb</sub> = 20 °C, P = 86 kPa to 106 kPa, RH = 45 % to 75 %.

Table 2

ELEC	ELECTRICAL DATA AND ORDERING INFORMATION							
U <sub>R</sub> (V)	U <sub>C</sub> (V)	C <sub>R</sub> (μF)	CASE SIZE Ø D x L (mm)	I <sub>R</sub> 100 Hz 105 °C (A) <sup>(1)</sup>	I <sub>L</sub> 1 min (mA)	ESR 100 Hz MAX. (mΩ)	Z 10 kHz MAX. (mΩ)	ORDERING CODE
		220	35 x 30	1.35	0.6	900	600	MAL219390101E3
		330	35 x 40	1.74	0.9	600	400	MAL219390102E3
500	450	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  $U_{max.} \leq U_C$ 



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ADDITIONAL ELECTRICAL DATA						
PARAMETER	CONDITIONS	VALUE				
Voltage						
Surge voltage		$U_{s} = 1.1 \times U_{C}$				
Reverse voltage		U <sub>rev</sub> ≤ 1 V				
Current						
Leakage current	After 1 min at U <sub>R</sub>	$I_{L1} \le 0.006 C_R \times U_C$				
Leakage current	After 5 min at U <sub>R</sub>	$I_{L5} \le 0.002 C_R \times U_C$				
Inductance						
Equivalent series inductance (ESL)	All case sizes	ca. 20 nH				

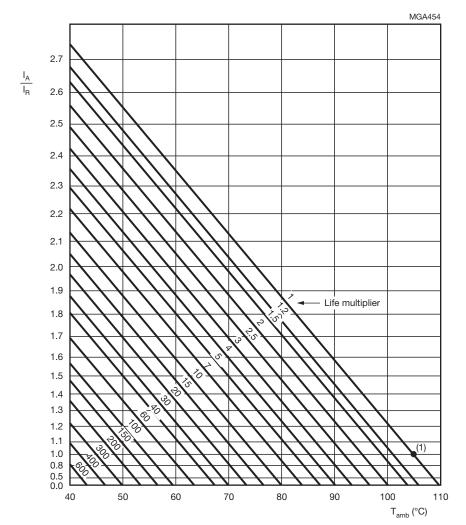
#### RIPPLE CURRENT AND USEFUL LIFE

#### Table 3

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

#### Note

• Multiplier of useful life code: MGA454



 $I_A = Actual ripple current at 120 Hz$ 

Fig. 4 - Multiplier of useful life as a function of ambient temperature and ripple current load

 $<sup>\</sup>rm I_R = Rated$  ripple current at 120 Hz and 105  $^{\circ} \rm C$ 

<sup>(1)</sup> Useful life at 105 °C and I<sub>R</sub> applied: 6000 h



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#### Table 4

MULTIPLIER OF RIPPLE CURRENT (I <sub>R</sub> ) AS A FUNCTION OF FREQUENCY					
FREQUENCY (Hz)					
50	100	120	200	1000	≥ 10 000
I <sub>R</sub> MULTIPLIER					
0.90	0.95	1.00	1.15	1.30	1.40

#### Table 5

TEST PROCEDURES AND REQUIREMENTS					
TEST		PROCEDURE	REQUIREMENTS		
NAME OF TEST	REFERENCE	(quick reference)	NEQUINEMENTS		
Endurance	IEC 60384-4 / EN130301 subclause 4.13	T <sub>amb</sub> = 50 °C; U <sub>R</sub> = 500 V applied; 5000 h	$\Delta$ C/C: $\pm$ 15 % ESR $\leq$ 1.5 x spec. limit Z $\leq$ 2 x spec. limit $I_{L5} \leq$ spec. limit		
Useful life	EN130301 subclause 1.8.1	T <sub>amb</sub> = 105 °C; U <sub>C</sub> and I <sub>R</sub> applied; 6000 h	$  \Delta C/C: \pm 30 \ \% $ ESR $\leq 3 \ x \ \text{spec. limit} $ Z $\leq 3 \ x \ \text{spec. limit} $ I <sub>L5</sub> $\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 °C; no voltage applied; 1000 h after test: U <sub>C</sub> to be applied for 30 min, 24 h to 48 h before measurement	$\Delta$ C/C: $\pm$ 15 % ESR $\leq$ 1.5 x spec. limit $I_{L5} \leq$ 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.



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