

## Aluminum 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](http://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  $\mu\text{F}$ )
- 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

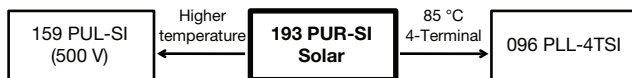


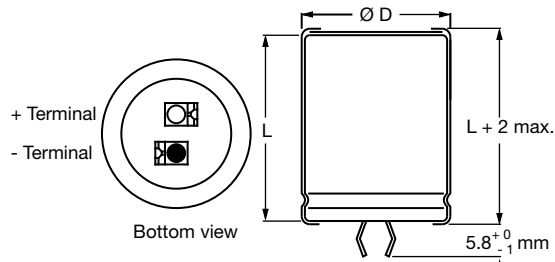
Fig. 1

QUICK REFERENCE DATA	
DESCRIPTION	VALUE
Nominal case size (D x L in mm)	35 x 30 to 35 x 40
Rated capacitance range, $C_R$	220 $\mu\text{F}$ to 560 $\mu\text{F}$
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
Max. RMS value of ripple voltage	12 V

SELECTION CHART FOR $C_R$ , $U_R$ , AND RELEVANT NOMINAL CASE SIZES ( $\varnothing$ D x L in mm)					
$C_R$ ( $\mu\text{F}$ )	$U_R$ (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

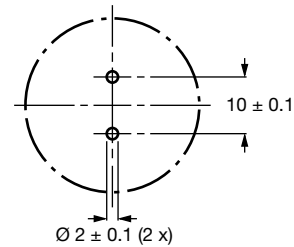


Fig. 3 - Mounting hole diagram

Table 1

DIMENSIONS in millimeters, MASS AND PACKAGING QUANTITIES					
NOMINAL CASE SIZE	$\varnothing D_{\text{max.}}$	$L_{\text{max.}}$	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  $T_{\text{amb}} = 20 \text{ °C}$ ,  $P = 86 \text{ kPa}$  to  $106 \text{ kPa}$ ,  $RH = 45 \%$  to  $75 \%$ .

### ORDERING EXAMPLE

Electrolytic capacitors 470  $\mu\text{F}/500 \text{ V}$   
 Nominal case size:  $\varnothing 35 \text{ mm} \times 50 \text{ mm}$   
 Ordering code: MAL219390104E3

Table 2

ELECTRICAL DATA AND ORDERING INFORMATION								
$U_R$ (V)	$U_C$ (V)	$C_R$ ( $\mu\text{F}$ )	CASE SIZE $\varnothing D \times L$ (mm)	$I_R$ 100 Hz 105 °C (A) <sup>(1)</sup>	$I_L$ 1 min (mA)	ESR 100 Hz MAX. (m $\Omega$ )	Z 10 kHz MAX. (m $\Omega$ )	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

- <sup>(1)</sup> At  $U_{\text{max.}} \leq U_C$



ADDITIONAL ELECTRICAL DATA		
PARAMETER	CONDITIONS	VALUE
<b>Voltage</b>		
Surge voltage		$U_s = 1.1 \times U_C$
Reverse voltage		$U_{rev} \leq 1 \text{ V}$
RMS value of ripple voltage		$U_{RPL} \leq 12 \text{ V}$
<b>Current</b>		
Leakage current	After 1 min at $U_R$	$I_{L1} \leq 0.006 C_R \times U_C$
	After 5 min at $U_R$	$I_{L5} \leq 0.002 C_R \times U_C$
<b>Inductance</b>		
Equivalent series inductance (ESL)	All case sizes	ca. 20 nH

Table 3

MULTIPLIER OF RIPPLE CURRENT ( $I_R$ ) AS A FUNCTION OF FREQUENCY	
FREQUENCY (Hz)	$I_R$ MULTIPLIER
50	0.80
100	1.00
200	1.20
400	1.30
1000	1.40
10 000	1.50

Table 4

TEST PROCEDURES AND REQUIREMENTS			
TEST		PROCEDURE (quick reference)	REQUIREMENTS
NAME OF TEST	REFERENCE		
Endurance	IEC 60384-4/ EN130301 subclause 4.13	$T_{amb} = 50 \text{ }^\circ\text{C}$ ; $U_R = 500 \text{ V}$ 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	$T_{amb} = 105 \text{ }^\circ\text{C}$ ; $U_C$ 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	$T_{amb} = 105 \text{ }^\circ\text{C}$ ; no voltage applied; 1000 h after test: $U_C$ to be applied for 30 min, 24 h to 48 h before measurement	$\Delta C/C: \pm 15 \%$ $ESR \leq 1.5 \times \text{spec. limit}$ $I_{L5} \leq 2 \times \text{spec. limit}$



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