

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

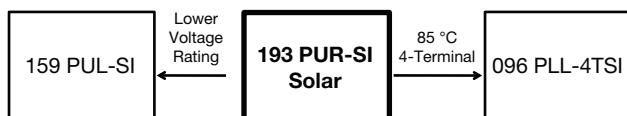


Fig. 1

## QUICK REFERENCE DATA

DESCRIPTION	VALUE
Nominal case size (D x L in mm)	35 x 30 to 35 x 60
Rated capacitance range, $C_R$	220 $\mu$ F to 560 $\mu$ 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

## FEATURES

- Specified for 500 V, 50 °C operation
- Long useful life at 450 V, 105 °C
- Long useful life at 500 V, 50 °C with no ripple current applied
- Low ESR, high ripple current capability

## 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

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

C <sub>R</sub> ( $\mu$ F)	U <sub>R</sub> (V)				
	500				
220	35 x 30	-	-	-	-
330	-	35 x 40	-	-	-
390	-	-	35 x 45	-	-
470	-	-	-	35 x 50	-
560	-	-	-	-	35 x 60

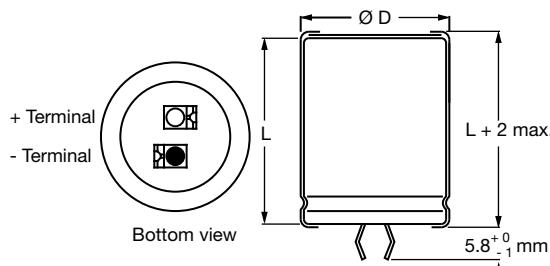
**DIMENSIONS** in millimeters **AND AVAILABLE FORMS**
**TWO TERMINAL SNAP-IN**


Fig. 2 - Two terminal snap-in

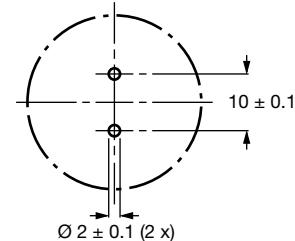


Fig. 3 - Mounting hole diagram

**Table 1**

<b>DIMENSIONS</b> in millimeters, <b>MASS AND PACKAGING QUANTITIES</b>					
<b>NOMINAL CASE SIZE</b>	<b>Ø D<sub>max.</sub></b>	<b>L<sub>max.</sub></b>	<b>MASS (g)</b>	<b>PACKAGING QUANTITIES (unit per box)</b>	<b>CARDBOARD BOX DIMENSIONS L x W x H</b>
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.

<b>ELECTRICAL DATA</b>	
<b>SYMBOL</b>	<b>DESCRIPTION</b>
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 µF/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**

<b>ELECTRICAL DATA AND ORDERING INFORMATION</b>								
<b>U<sub>R</sub> (V)</b>	<b>U<sub>C</sub> (V)</b>	<b>C<sub>R</sub> (µF)</b>	<b>CASE SIZE Ø D x L (mm)</b>	<b>I<sub>R</sub> 100 Hz 105 °C (A) <sup>(1)</sup></b>	<b>I<sub>L</sub> 1 min (mA)</b>	<b>ESR 100 Hz MAX. (mΩ)</b>	<b>Z 10 kHz MAX. (mΩ)</b>	<b>ORDERING CODE</b>
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<sub>max.</sub> ≤ U<sub>C</sub>

<b>ADDITIONAL ELECTRICAL DATA</b>		
<b>PARAMETER</b>	<b>CONDITIONS</b>	<b>VALUE</b>
<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**

<b>TEST PROCEDURES AND REQUIREMENTS</b>			
<b>TEST</b>		<b>PROCEDURE</b> (quick reference)	<b>REQUIREMENTS</b>
<b>NAME OF TEST</b>	<b>REFERENCE</b>		
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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