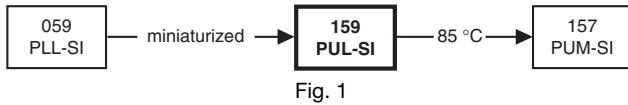


## Aluminum Electrolytic Capacitors Power Ultra Long Life Snap-In



QUICK REFERENCE DATA	
DESCRIPTION	VALUE
Nominal case size (Ø D x L in mm)	22 x 30 to 35 x 55
Rated capacitance range (E6 / E12 series), C <sub>R</sub>	68 µF to 470 µF
Tolerance on C <sub>R</sub>	± 20 %
Rated voltage range, U <sub>R</sub>	500 V
Category temperature range	-25 °C to +105 °C
Endurance test at 105 °C	2000 h
Load life at 105 °C	2000 h
Useful life at 105 °C	3000 h
Useful life at 40 °C and 1.6 x I <sub>R</sub> applied	300 000 h
Shelf life at 0 V, 105 °C	1000 h
Based on sectional specification	IEC 60384-4 / EN130300
Climatic category IEC 60068	25 / 105 / 56

### FEATURES

- Useful life: 3000 h at 105 °C
- Available in 500 V
- Polarized aluminum electrolytic capacitors, non-solid electrolyte
- Large types, very small dimensions, cylindrical aluminum case, insulated with a blue sleeve
- Low ESR, high ripple current capability
- Keyed polarity snap-in version available
- 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
- General purpose, industrial and audio / video systems
- Smoothing and filtering
- Standard and switched mode power supplies
- Energy storage in pulse systems

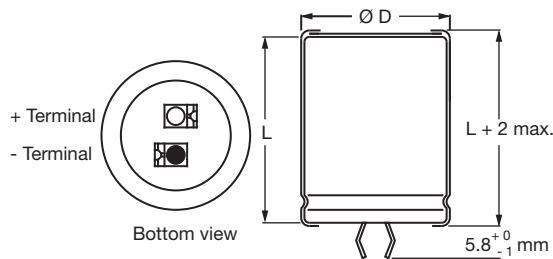
### MARKING

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 (M for ± 20 %)
- Rated voltage (in V)
- Date code (YYMM or in 2 digits according to 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, last 8 digits 159 xxxxx
- Climatic category in accordance with IEC 60068

### 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

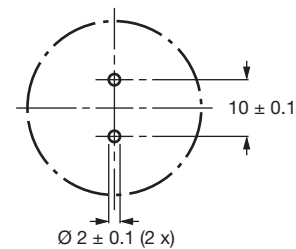
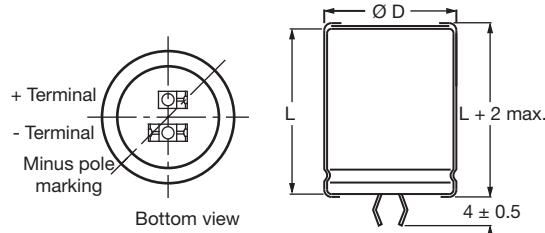


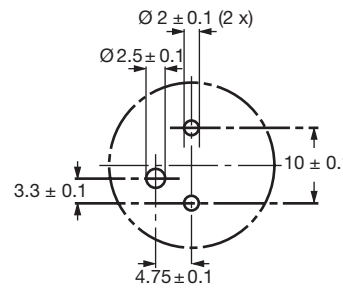
Fig. 3 - Mounting hole diagram

### THREE TERMINAL SNAP-IN



The negative terminal has **TWO** pins which are **BOTH** electrically connected

Fig. 4 - Three terminal snap-in



The 10 mm spacing of the 2 pin snap-in is used as the base layout and a third hole is added. The third hole is closer to the negative primary hole so that polarization is always maintained, together with added mechanical stability.

Fig. 5 - Mounting hole diagram

Table 1

DIMENSIONS in millimeters, MASS AND PACKAGING QUANTITIES					
NOMINAL CASE SIZE Ø D x L	Ø D <sub>max.</sub>	L <sub>max.</sub>	MASS (g)	PACKAGING QUANTITIES (units per box)	CARDBOARD BOX DIMENSIONS L x W x H
22 x 30	23	32	≈ 16	100	260 x 250 x 44
22 x 35	23	37	≈ 20	100	260 x 250 x 49
25 x 35	26	37	≈ 24	100	290 x 280 x 49
25 x 40	26	42	≈ 27	100	290 x 280 x 54
25 x 45	26	47	≈ 32	100	290 x 280 x 59
30 x 35	31	37	≈ 35	100	340 x 330 x 49
30 x 40	31	42	≈ 40	100	340 x 330 x 54
30 x 50	31	52	≈ 50	100	340 x 330 x 64
35 x 45	36	47	≈ 63	50	390 x 198 x 59
35 x 50	36	52	≈ 72	50	390 x 198 x 64
35 x 55	36	57	≈ 80	50	390 x 198 x 69

ELECTRICAL DATA	
SYMBOL	DESCRIPTION
C <sub>R</sub>	Rated capacitance at 100 Hz
I <sub>R</sub>	Rated RMS ripple current at 120 Hz, 105 °C
I <sub>L5</sub>	Max. leakage current after 5 min at U <sub>R</sub>
ESR	Typ. / max. equivalent series resistance at 100 Hz <sup>(1)</sup>
Z	Typ. / max. impedance at 10 kHz

#### Notes

- 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 %
- <sup>(1)</sup> ESR at 120 Hz is approximately 0.95 x ESR 100 Hz

#### ORDERING EXAMPLE

Electrolytic capacitor 159 series  
120 µF / 500 V; ± 20 %  
Nominal case size: Ø 25 mm x 40 mm

#### 2-terminal snap-in:

Ordering code: MAL215959121E3

#### 3-terminal snap-in:

Ordering code: MAL215979121E3



Table 2

ELECTRICAL DATA AND ORDERING INFORMATION										
U <sub>R</sub> (V)	C <sub>R</sub> 100 Hz (μF)	NOMINAL CASE SIZE Ø D x L (mm)	I <sub>R</sub> 120 Hz 105 °C (A)	I <sub>L5</sub> 5 min (mA)	TYP. ESR 100 Hz <sup>(1)</sup> (mΩ)	MAX. ESR 100 Hz <sup>(1)</sup> (mΩ)	TYP. Z 10 kHz (mΩ)	MAX. Z 10 kHz (mΩ)	ORDERING CODE MAL2159.....	
									2-TERM.	3-TERM.
500	68	22 x 30	0.60	0.34	1540	2000	1200	1500	59689E3	79689E3
	82	22 x 35	0.69	0.41	1280	1660	990	1240	59829E3	79829E3
	100	25 x 35	0.80	0.50	1050	1370	820	1030	59101E3	79101E3
	120	25 x 40	0.91	0.60	880	1140	690	860	59121E3	79121E3
	150	25 x 45	1.08	0.75	700	920	550	690	59151E3	79151E3
	150	30 x 35	1.06	0.75	710	930	560	700	49151E3	69151E3
	180	30 x 35	1.13	0.90	600	780	480	600	59181E3	79181E3
	220	30 x 40	1.30	1.10	500	640	390	490	59221E3	79221E3
	270	30 x 50	1.58	1.35	400	520	320	400	59271E3	79271E3
	330	35 x 45	1.74	1.65	340	440	270	340	49331E3	69331E3
	390	35 x 50	1.94	1.95	290	380	230	290	59391E3	79391E3
470	35 x 55	2.15	2.35	240	320	200	250	59471E3	79471E3	

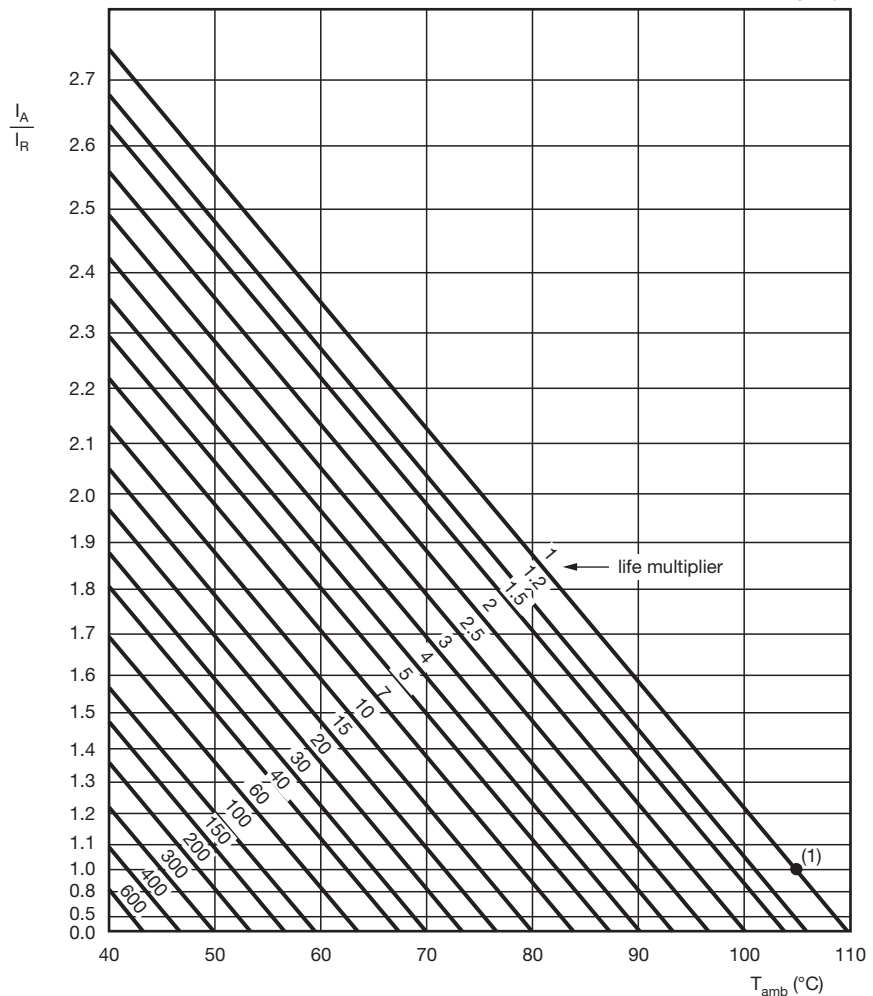
Note

<sup>(1)</sup> ESR at 120 Hz is approximately 0.95 x ESR 100 Hz

ADDITIONAL ELECTRICAL DATA		
PARAMETER	CONDITIONS	VALUE
<b>Voltage</b>		
Surge voltage		$U_s = 1.1 \times U_R$
Reverse voltage		$\leq 1 \text{ V}$
<b>Current</b>		
Leakage current	After 5 min at $U_R$	$I_{L5} \leq 0.01 C_R \times U_R$
<b>Inductance</b>		
Equivalent series inductance (ESL)	All case sizes	Typ. 19 nH
		Max. 25 nH

**RIPPLE CURRENT AND USEFUL LIFE**

MGA454



$I_A$  = Actual ripple current at 120 Hz  
 $I_R$  = Rated ripple current at 120 Hz and 105 °C  
<sup>(1)</sup> Useful life at 105 °C and  $I_R$  applied: 3000 h

Fig. 6 - Multiplier of useful life as a function of ambient temperature and ripple current load

**Table 3**

ENDURANCE TEST DURATION AND USEFUL LIFE	
ENDURANCE AT 105 °C (h)	USEFUL LIFE AT 105 °C (h)
2000	3000

**Note**

- Multiplier of useful life code: MGA454

**Table 4**

MULTIPLIER OF RIPPLE CURRENT ( $I_R$ ) AS A FUNCTION OF FREQUENCY					
FREQUENCY (Hz)					
50	100	120	200	1000	≥ 10 000
$I_R$ MULTIPLIER					
0.90	0.95	1.00	1.15	1.30	1.40



Table 5

<b>TEST PROCEDURES AND REQUIREMENTS</b>			
<b>TEST</b>		<b>PROCEDURE (quick reference)</b>	<b>REQUIREMENTS</b>
<b>NAME OF TEST</b>	<b>REFERENCE</b>		
Endurance	IEC 60384-4 / EN130300 subclause 4.13	$T_{amb} = 105\text{ °C}$ ; $U_R$ applied; 2000 h	$\Delta C/C: \pm 15\%$ ESR $\leq 1.3 \times$ spec. limit $I_{L5} \leq$ spec. limit
Load life		$T_{amb} = 105\text{ °C}$ ; $U_R$ and $I_R$ applied; 2000 h	$\Delta C/C: \pm 20\%$ ESR $\leq 2 \times$ spec. limit $I_{L5} \leq$ spec. limit
Useful life	CECC 30301 subclause 1.8.1	$T_{amb} = 105\text{ °C}$ ; $U_R$ and $I_R$ applied; 3000 h	$\Delta C/C: \pm 30\%$ ESR $\leq 3 \times$ spec. limit $I_{L5} \leq$ spec. limit total failure percentage: $\leq 3\%$
Shelf life (storage at high temperature)	IEC 60384-4 / EN130300 subclause 4.17	$T_{amb} = 105\text{ °C}$ ; no voltage applied; 1000 h after test: $U_R$ to be applied for 30 min, 24 h to 48 h before measurement	$\Delta C/C: \pm 15\%$ ESR $\leq 1.5 \times$ spec. limit $I_{L5} \leq$ 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.

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.