Rectangular Aluminum Polymer Capacitors

APL9V, +125C, Polymer High Voltage, AEC-Q200

Overview

The KEMET APL9V is an AEC-Q200 qualified automotive-grade aluminum polymer capacitor, engineered for high-voltage, high-temperature applications requiring compact, low-profile, or small-footprint solutions. With a rated temperature of 125ºC, the APL9V delivers exceptional volumetric efficiency and high ripple current performance. Its robust design ensures excellent vibration resistance, making it ideal for harsh environments.
The APL9V's rectangular shape allows for stacking into modules, enabling series connections for up to 500VDC at high temperatures using solid polymer technology. The flat surfaces of the aluminum case facilitate use of a heat sink on either the wide or narrow side to dissipate heat. It is a great solution for applications requiring very low profiles. This capacitor can be mounted horizontally or vertically, optimizing space while maximizing thermal management. Ideal for high-voltage applications, the APL9V is an ideal choice for use in HV inverters, e-compressors, motor control, and other power electronics where reliability and high performance are critical.

Applications

Typical applications are mainly in the field of automotive, such as DC link, power electronics, energy storage, renewable energy grid interface, motor drives, and automotive applications. For 500V needs, modules can be supplied upon request

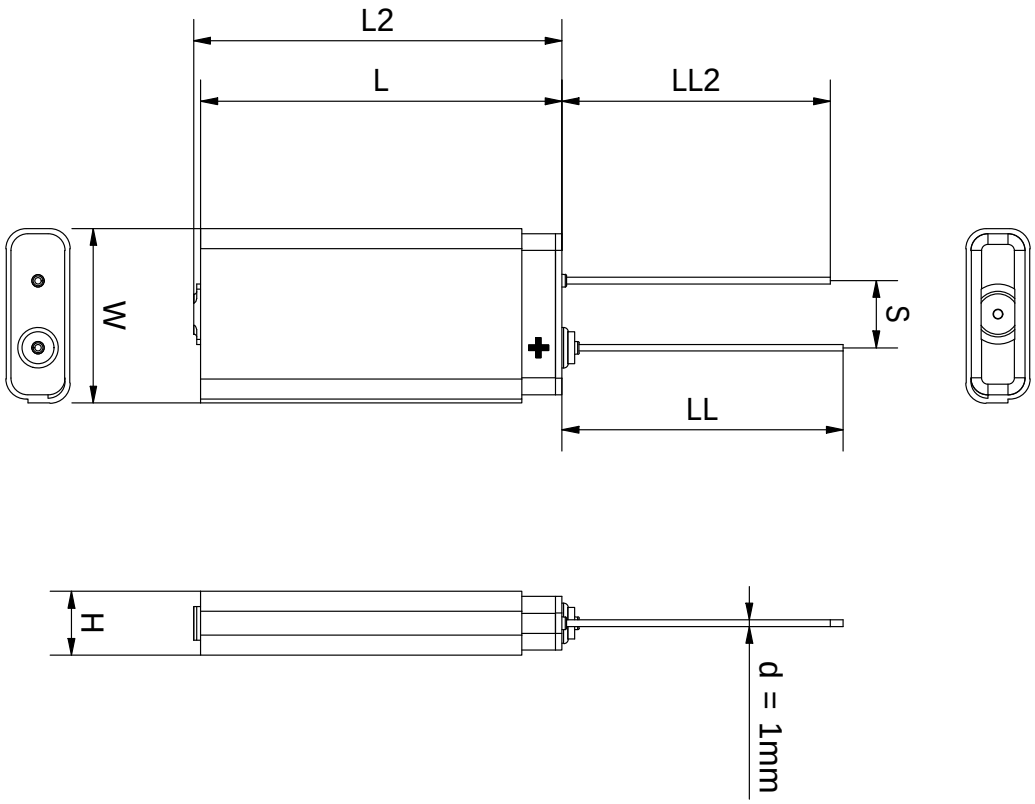
Benefits

- 250V Solid Polymer capacitor – use in series for up to 500V in applications
- Rectangular shape for good volumetric efficiency and modular stacking options
- Easy use of multiple heat sink options - allowing IAC optimization
- Height restriction solution / Compactness
- Life of 2,000 hours at +125°C [(VR) and (IR) applied]
- AEC-Q200 qualified for automotive applications
- High vibration up to 20 g
- Excellent ripple current capability - Up to 12.4A
- Excellent surge voltage capability

Part Number System

APL9V	A	600	LH	250
Series	Termination	Capacitance Code (µF)	Size Code	Rated Voltage (VDC)
Aluminum Polymer Rectangular	See Termination Table	First two digits represent significant figures. Third digit specifies number of zeros.	See Dimension Table	250 = 250

Termination Style and Dimensions – Millimeters



Size Code	Dimensions* in mm							Approximate Weight (Grams)
	H	W	L	L2	LL	LL2	S	
	±0.5	±0.5	±0.5	±2	± 2	± 2	± 1	
LH	9.5	26.0	53.8	54.9	42.0	40.0	10.0	30

Case Aluminum with Stainless Steel Shell. (*) Dimensions including Shell
Leads Copper wire with tin electroplate

Performance Characteristics

Item	Performance Characteristics	
Capacitance Range	60 µF	
Rated Voltage	250 VDC	
Operating Temperature	–55 to +125°C	
Storage Temperature Range	–55 to +125°C	
Capacitance Tolerance	±20% select values at 100 Hz/+20°C	
Operational Lifetime	Rated voltage, +125°C, Rated ripple current	
	2,000 hours	
Leakage Current	I < 0.01 CV (µA) Leakage current performance is in line with wet and hybrid polymer electrolytic capacitor's behaviour. Leakage current limit is calculated under same principle being 1/20 x lower than conventional solid polymer capacitors.	
	C = rated capacitance (µF), V = rated voltage (VDC). Voltage applied for 5 minutes at +20°C	
Typical ESL	The series inductance (ESL) depends on wire length and mounting conditions. ESL of 4 nH at 1 MHz for approx. 5mm wire terminals	
Vibration Test Specifications	**Procedure**	**Requirements**
	1.5 mm displacement amplitude or 20 g maximum acceleration. Vibration applied for three directions of 4-hour sessions at 10 – 2,000 Hz. (Capacitor clamped by body.)	No visible capacitor body damage. Deviations in capacitance from initial measurements must not exceed Δ C/C ±5%

Surge Voltage

Test Condition	Voltage (VDC)
	250
≤ 30 second surge followed by a no load period of 330 seconds, 1,000 cycles at +125°C	275

Test Method & Performance

Endurance Life Test	
Conditions	**Performance**
Temperature	+125°C
Test Duration	2,000 hours
Ripple Current	Rated ripple current specified in table
Voltage	The sum of DC voltage and the peak AC voltage must not exceed the rated voltage of the capacitor
Shelf Life Test	
Temperature	+125°C
Test Duration	1,000 hours
Ripple Current	No Ripple current applied
Voltage	No voltage applied
The following specifiations will be satisfied when the capacitor is tested at +20°C (±5°C)	
Capacitance Change	Within 15% of the initial value
Equivalent Series Resistance	Does not exceed 2x initial measured value
Leakage Current	Does not exceed leakage current limit

Shelf Life and Re-Ageing

The capacitance, ESR and impedance of a capacitor will not change significantly after extended storage periods, however the leakage current will very slowly increase.

After long periods of storage, it could be a benefit to re-age the capacitors as common practice for Aluminum capacitors. Leakage current performance is in line with wet and hybrid electrolytic capacitor's behaviour. Leakage current limit is calculated under same principle.

Reliability

Reliability
The reliability of a component can be defined as the probability that it will perform satisfactorily under a given set of conditions for a given length of time. In practice, it is impossible to predict with absolute certainty how any individual component will perform. Therefore, we must utilize probability theory. It is also necessary to clearly define the level of stress involved (e.g., operating voltage, ripple current, temperature, and time.) Finally, the meaning of satisfactory performance must be defined by specifying a set of conditions, which determine the end of life of the component.

End of Life Definition
Catastrophic failure: short circuit, open circuit or safety vent operation
Parametric failure:
- Change in capacitance > ±15%
- Leakage current > initial specified limit
- ESR > 2x ESR Limit

Mechanical Data

Installing
As general principle, KEMET recommends:
• The maximum rated temperature of the capacitor must not be exceeded.
• Ensure that the voltage across each capacitor does not exceed its rated voltage.
• Ensure electrical insulation between the capacitor case, negative terminal, positive terminal and PCB.
• Verify the correct polarization of the capacitor on the board.
• Do not cover the safety vent.
• Due to its rectangular shape, our APL9V product families offer the ability of stack capacitors, getting a modular arrangement. Also, easy use of heat sink condition is allowed to improve ripple current capability. More technical information related with this benefit can be checked under our specific Application Notes for Rectangular Aluminum Products.

Polarity & Reversed Voltage
Aluminium electrolytic capacitors manufactured for use in DC applications contain an anode foil and a cathode foil. As such, they are polarized devices and must be connected with the +Ve to the anode foil and the -Ve to the cathode foil. If this were to be reversed, then the electrolytic process that took place in forming the oxide layer on the anode would be recreated in trying to form an oxide layer on the cathode. In forming the cathode foil in this way, heat would be generated and gas given off within the capacitor, usually leading to failure.

The cathode foil already possesses a thin stabilized oxide layer. This thin oxide layer is equivalent to a forming voltage of approximately 2 V. As a result, the capacitor can withstand a voltage reversal of up to 1.5 V for short periods. Above this voltage, the formation process will commence.

Mounting Position
The capacitor can be mounted upright or inclined to a horizontal position. For the vibration specifications to be valid, the capacitor must always be clamped by the body. The leads and connection tabs cannot provide the support necessary to stabilize the capacitor. Take care not to cover the safety vent with any materials used in the clamping operation.

Environmental Compliance

As an environmentally conscious company, KEMET is working continuously with improvements concerning the environmental effects of both our capacitors and their production.

In Europe (RoHS Directive) and in some other geographical areas like China, legislation has been put in place to prevent the use of some hazardous materials, such as lead (Pb), in electronic equipment. All products in this catalog are produced to help our customers' obligations to guarantee their products and fulfill these legislative requirements. The only material of concern in our products has been lead (Pb), which has been removed from all designs to fulfill the requirement of containing less than 0.1% of lead in any homogeneous material.
KEMET will closely follow any changes in legislation world wide and makes any necessary changes in its products, whenever needed.

Some customer segments such as medical, military, and automotive electronics may still require the use of lead in electrode coatings. To clarify the situation and distinguish products from each other, a special symbol is used on the packaging labels for RoHS compatible capacitors.

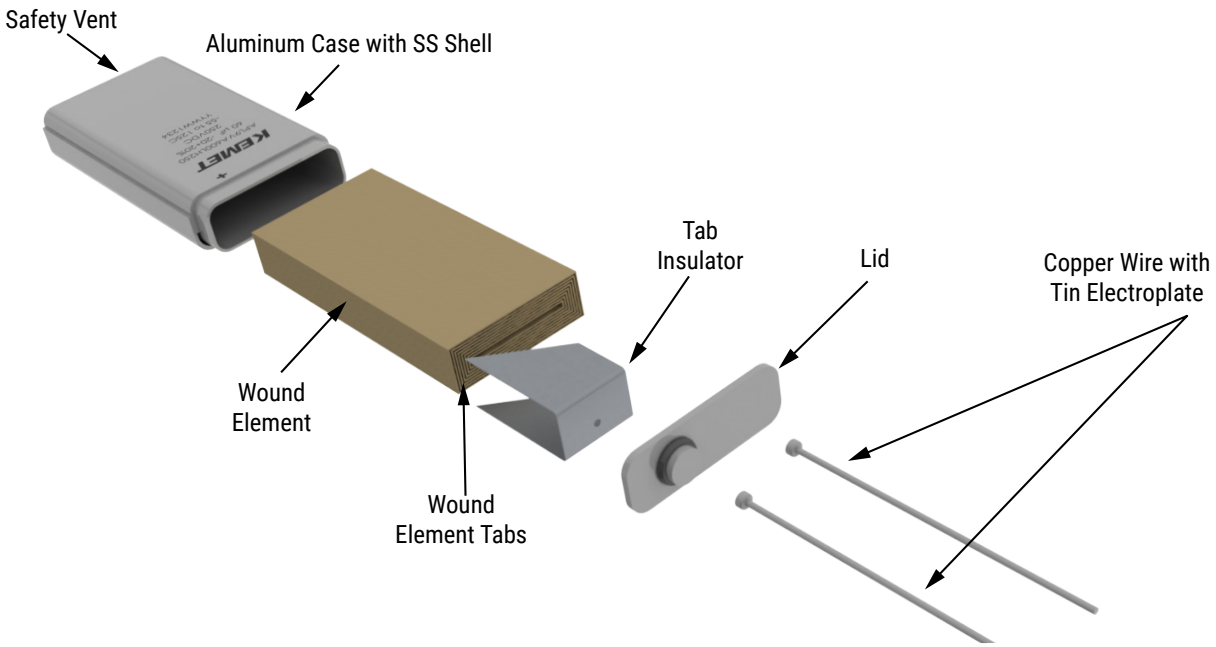
Due to customer requirements, there may appear additional markings such as lead-free (LF) or lead-free wires (LFW) on the label.

Table 1 – Ratings & Part Number Reference

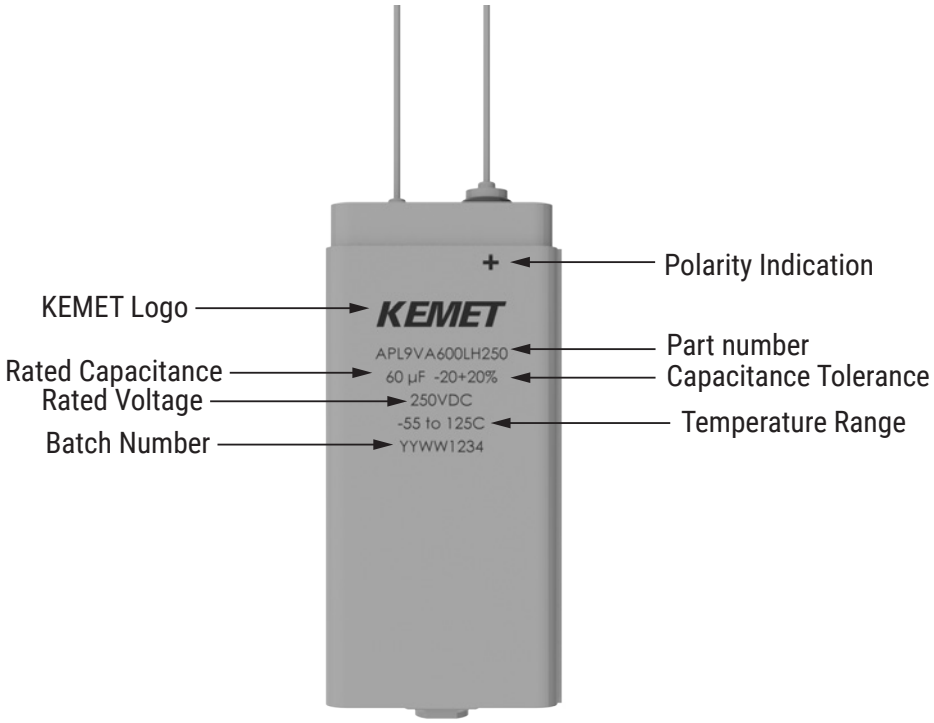
Rated Voltage	Rated Capacitance	Size Code	Case Size	Ripple Current				ESR Maximum		Part Number
(VDC)	100 Hz, 20°C (µF)		W x L (mm)	10 kHz, 125°C (A)[1]	100 kHz, 125°C (A)[1]	10 kHz, 125°C (A)[2]	100 kHz, 125°C (A)[2]	10 kHz, 20°C (mOhms)	100 kHz, 20°C (mOhms)	
250	60	LH	26 x 53.8	2.69	5.06	6.62	12.44	90	25.5	APL9VA600LH250

[1] Natural Convection - Ambient Temperature
[2] Capacitor-mounted with low thermal resistance path (heat-sink) - Capacitor case Temperature

Construction



Marking



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Although KEMET designs and manufactures its products to the most stringent quality and safety standards, given the current state of the art, isolated component failures may still occur. Accordingly, customer applications which require a high degree of reliability or safety should employ suitable designs or other safeguards (such as installation of protective circuitry or redundancies) in order to ensure that the failure of an electrical component does not result in a risk of personal injury or property damage.

Although all product–related warnings, cautions and notes must be observed, the customer should not assume that all safety measures are indicated or that other measures may not be required.

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