Axial Aluminum Electrolytic Capacitors

# PEG126, +150°C

Electronic Components

KEMET CHARGED.

## Overview

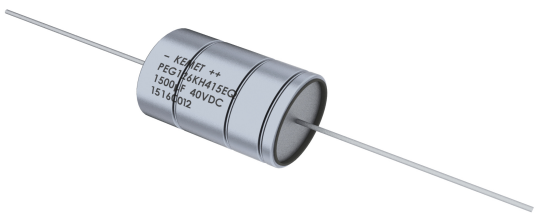
KEMET's PEG126 is an electrolytic capacitor with an outstanding electrical performance. The device has a polarized all-welded design, tinned copper wire leads, a negative pole connected to the case, and a plastic insulation. The PEG126 winding is housed in a cylindrical aluminum can with a high purity aluminum lid and a high quality rubber gasket. The low ESR is the result of a low resistive electrolyte/paper system and an all-welded design. Thanks to its mechanical robustness, the PEG126 is suitable for use in mobile and aircraft installations, with operation up to +150°C. KEMET's automotive grade capacitors meet the demanding Automotive Electronics Council's AEC–Q200 qualification requirements.

## Applications

KEMET's PEG126 is a high performance axial electrolytic capacitor. It is designed for automotive applications, with high demands on resistance to vibrations and high ambient temperature.

## Benefits

- AEC–Q200 automotive qualified
- 2,000 hours at +150°C (D20 Case Size)
- Resistance to vibrations
- Resistance to high ambient temperature
- Low ESR
- High ripple capability
- Polarized all-welded design
- Outstanding electrical performance



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## Part Number System

| PEG126 | H | F | 368 | E | Q | E1 |
|---|---|---|---|---|---|---|
| Series | Rated Voltage (VDC) | Size Code | Capacitance Code (µF) | Version | Capacitance Tolerance | Packaging |
| Axial Aluminum Electrolytic | H = 25<br>K = 40<br>M = 63 | See Dimension Table | The last two digits represent significant figures. The first digit indicates the total number digits. | E = Standard (with shrink tape) | Q = −10/+30%<br>M = ±20% | E1 = Bulk |



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## Performance Characteristics

| Item | Performance Characteristics | | |
|---|---|---|---|
| Capacitance Range | 250 – 4,000 µF | | |
| Rated Voltage | 25 – 63 VDC | | |
| Operating Temperature | –40 to +150°C | | |
| Capacitance Tolerance | –10/+30%, (±20% select values) at 100 Hz/+20°C | | |
| Operational Lifetime | D (mm) | +125°C (hours) | +150°C (hours) |
| | 16 | 6,300 | 1,500 |
| | 20 | 8,400 | 2,000 |
| Shelf Life | 5,000 hours at +105°C or 10 years at +40°C 0 VDC | | |
| Leakage Current | I = 0.003 CV + 4.0 (µA) | | |
| | C = rated capacitance (µF), V = rated voltage (VDC). Voltage applied for 5 minutes at +20°C. | | |
| Vibration Test Specifications | Procedure | | Requirements |
| | 1.5 mm displacement amplitude or 20 g maximum acceleration. Vibration applied for three 2-hour sessions at 10 – 2,000 Hz (capacitor clamped by body). | | No leakage of electrolyte or other visible damage. Deviations in capacitance from initial measurements must not exceed: Δ C/C < 5% |
| Standards | IEC 60384–4 long life grade 40/125/56, AEC-Q200 | | |

## Compensation Factor of Ripple Current (RC) vs. Frequency

| Frequency | 300 Hz | 1 kHz | 5 kHz | 100 kHz |
|---|---|---|---|---|
| Coefficient | 0.57 | 0.80 | 1.00 | 1.04 |

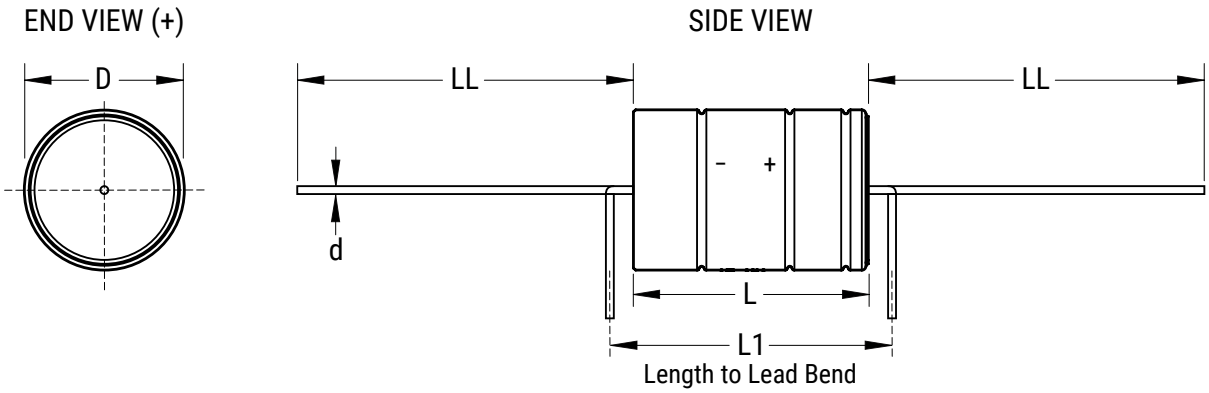
## Test Method & Performance

| Endurance Life Test | |
|---|---|
| Conditions | Performance |
| Temperature | +150°C |
| Test Duration | 1,500 hours (D = 16 mm) |
| | 2,000 hours (D = 20 mm) |
| Ripple Current | Maximum 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 |
| **Performance** | **The following specifications will be satisfied when the capacitor is tested at +20°C:** |
| Capacitance Change | Within 15% of the initial value |
| Equivalent Series Resistance | Does not exceed 200% of the initial value |
| Leakage Current | Does not exceed leakage current limit |

## Ordering Options Table

| Packaging Kind | Lead Length (mm) | Lead and Packaging Code |
|---|---|---|
| Standard Packaging Option | | |
| Bulk (box) | 42 +3/−2 | E1 |

## Dimensions – Millimeters




| Size Code | Dimensions in mm | | | | | Approximate Weight Grams |
|---|---|---|---|---|---|---|
| | D | L | L1 | d | LL | |
| | ±0.5 | ±1 | Minimum | ±0.03 | +3/−2 | |
| F | 16 | 29.0 | 35.0 | 1.0 | 42 | 8 |
| G | 16 | 37.0 | 43.0 | 1.0 | 42 | 11 |
| H | 20 | 29.0 | 35.0 | 1.0 | 42 | 13 |
| J | 20 | 37.0 | 43.0 | 1.0 | 42 | 20 |
| L | 20 | 46.0 | 52.0 | 1.0 | 42 | 24 |

Note: L1 is KEMET's recommendation for minimum distance between symmetrical lead bend. Available only for customer specific part numbers. Lead bend dimensions must be specified and confirmed per article.

## Shelf Life

The capacitance, ESR and impedance of a capacitor will not change significantly after extended storage periods, however, the leakage current will very slowly increase. KEMET products are particularly stable and allow a shelf life in excess of ten years at 40°C. See sectional specification under each product for specific data.

## Failure Rate

Estimated field failure rate: ≤ 0.15 ppm (failures per year/produced number of capacitors per year).
The expected failure rate for this capacitor range is based on field experience for capacitors with structural similarity.

## 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 make 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

| VDC | Rated Capacitance | Size Code | Case Size | Ripple Current Maximum | | | | ESR Maximum | | $L_{ESL}$ | Part Number |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100 Hz 20°C (µF) | | D x L (mm) | 100 Hz 125°C (A) | ≥ 5 kHz 105°C (A) | ≥ 5 kHz 125°C (A) | ≥ 5 kHz 150°C (A) | 100 Hz 20°C (mΩ) | 100 kHz 20°C (mΩ) | Approximate (nH) | |
| 25 | 680 | F | 16 x 29 | 1.4 | 6.9 | 4.1 | 1.6 | 120 | 43 | 10 | PEG126HF368EQE1 |
| 25 | 1000 | G | 16 x 37 | 1.7 | 8.8 | 5.2 | 2.0 | 80 | 28 | 12 | PEG126HG410EQE1 |
| 25 | 1500 | G | 16 x 37 | 2.1 | 9.2 | 5.4 | 2.1 | 63 | 26 | 12 | PEG126HG415EQE1 |
| 25 | 2200 | H | 20 x 29 | 2.5 | 9.4 | 5.5 | 2.1 | 51 | 25 | 12 | PEG126HH422EQE1 |
| 25 | 3300 | J | 20 x 37 | 3.2 | 11.7 | 6.9 | 2.6 | 34 | 17 | 15 | PEG126HJ433EQE1 |
| 25 | 4000 | L | 20 x 46 | 3.7 | 13.1 | 7.7 | 2.9 | 29 | 14 | 17 | PEG126HL440EME1 |
| 40 | 470 | F | 16 x 29 | 1.1 | 5.9 | 3.5 | 1.3 | 150 | 45 | 10 | PEG126KF347EQE1 |
| 40 | 600 | G | 16 x 37 | 1.4 | 8.3 | 4.9 | 1.9 | 120 | 30 | 12 | PEG126KG360EQE1 |
| 40 | 1000 | H | 20 x 29 | 1.9 | 9.4 | 5.5 | 2.1 | 75 | 23 | 12 | PEG126KH410EQE1 |
| 40 | 1200 | H | 20 x 29 | 2.0 | 9.0 | 5.3 | 2.0 | 71 | 26 | 12 | PEG126KH412EQE1 |
| 40 | 1500 | H | 20 x 29 | 2.2 | 9.7 | 5.7 | 2.2 | 58 | 22 | 12 | PEG126KH415EQE1 |
| 40 | 2200 | J | 20 x 37 | 2.8 | 11.4 | 6.7 | 2.6 | 43 | 18 | 15 | PEG126KJ422EQE1 |
| 40 | 2700 | L | 20 x 46 | 3.1 | 12.1 | 7.1 | 2.7 | 37 | 17 | 17 | PEG126KL427EQE1 |
| 63 | 250 | F | 16 x 29 | 0.9 | 5.3 | 3.1 | 1.2 | 240 | 53 | 10 | PEG126MF325EQE1 |
| 63 | 370 | G | 16 x 37 | 1.2 | 6.7 | 3.9 | 1.5 | 160 | 37 | 12 | PEG126MG337EQE1 |
| 63 | 470 | H | 20 x 29 | 1.4 | 7.3 | 4.3 | 1.6 | 130 | 32 | 12 | PEG126MH347EQE1 |
| 63 | 680 | J | 20 x 37 | 1.7 | 9.0 | 5.3 | 2.0 | 90 | 23 | 15 | PEG126MJ368EQE1 |
| 63 | 900 | L | 20 x 46 | 2.1 | 10.5 | 6.1 | 2.3 | 69 | 18 | 17 | PEG126ML390EQE1 |
| VDC | Rated Capacitance | Size Code | Case Size | Ripple Current | | | | ESR | | $L_{ESL}$ | Part Number |

## Operational Life

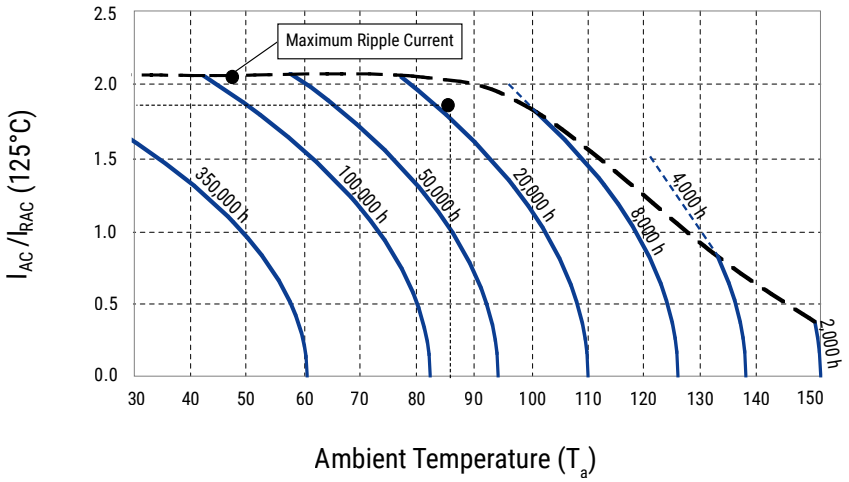
Operational life ($L_{op}$) at ambient temperature $T_a$ and ripple current $I_{AC}$.

**Diagram valid for 20 mm case size.**
Operational life,
16 mm case size: 0.75 x diagram value

Example:
Article: PEG126KJ422EQ (20 x 37 mm)
Ambient temperature ($T_a$): +85°C
Ripple current, at 10 kHz ($I_{AC}$): 12.0 A

$I_{RAC}$ (+125°C ≥ 5 kHz) = 6.7 A (from data table)
→ $I_{AC}/I_{RAC}$ (+125°C) = 12.0/6.7 = 1.8

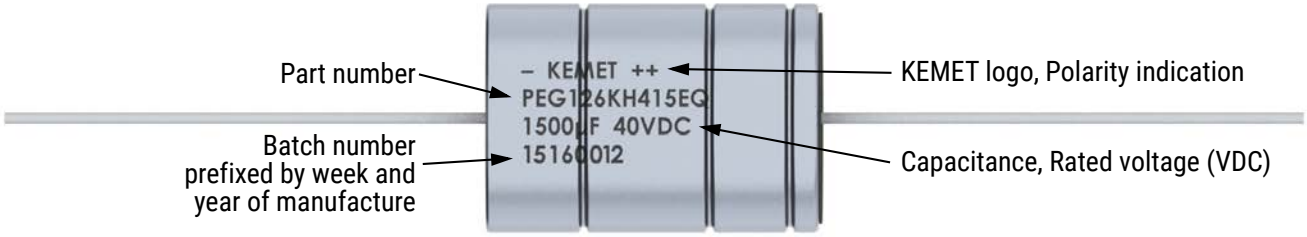
Operational life: Interpolation between the $L_{op}$-curves → $L_{op}$ ~ 18kh (blue curves)



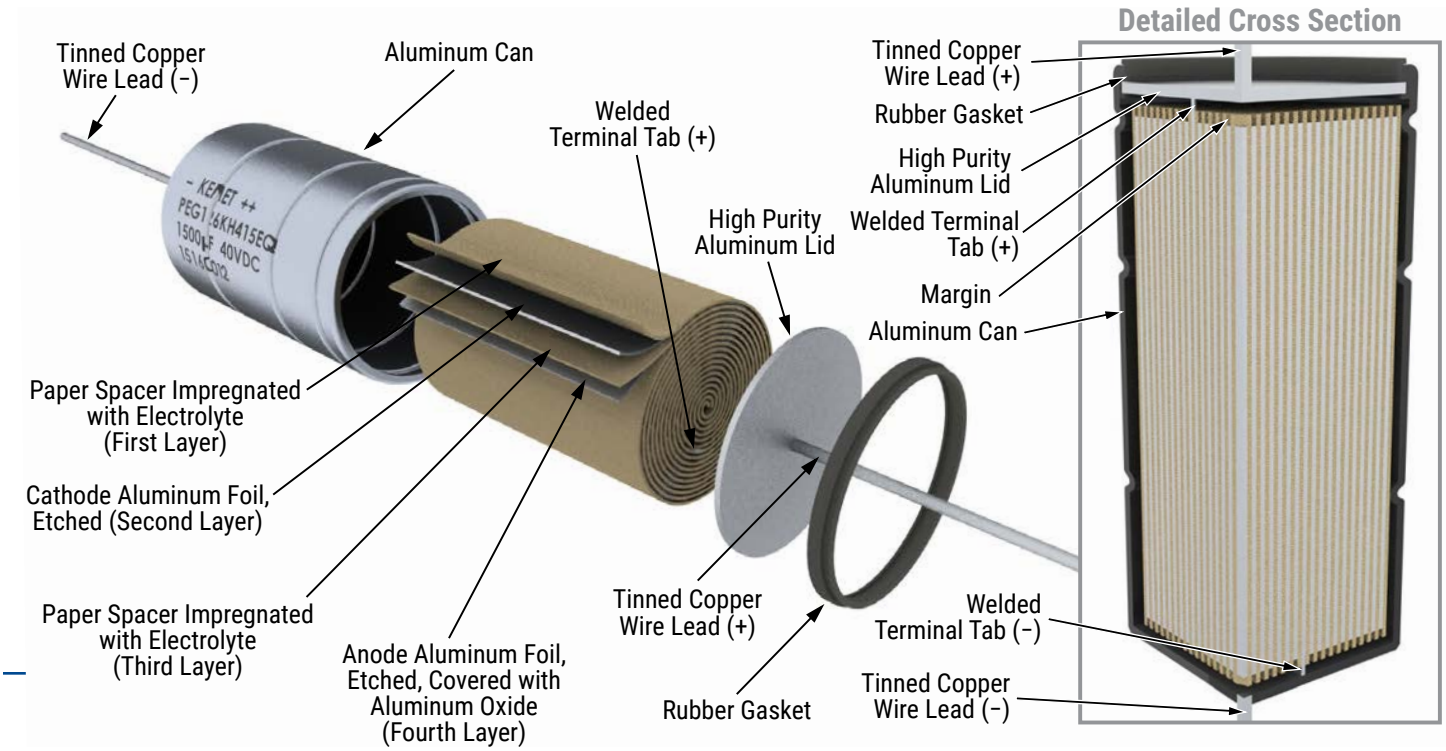
## Packaging Quantities

| Size Code | Packaging Quantities |
|---|---|
| | Bulk |
| F | 125 |
| G | 100 |
| H | 150 |
| J | 125 |
| L | 100 |

## Marking




## Construction



## Construction Data

The manufacturing process begins with the anode foil being electrochemically etched to increase the surface area and then "formed" to produce the aluminum oxide layer. Both the anode and cathode foils are then interleaved with absorbent paper and wound into a cylinder. During the winding process, aluminum tabs are attached to each foil to provide the electrical contact.

The winding is assembled to the capacitor Al-can and to the Al-lid. The can is filled with electrolyte and the winding is impregnated during a vacuum treatment. The capacitor is sealed. Throughout the process, all materials inside the housing must be maintained at the highest purity and be compatible with the electrolyte.

Each capacitor is aged and tested before being packed. The purpose of aging is to repair any damage in the oxide layer and thus reduce the leakage current to a very low level. Aging is carried out at elevated temperature and is accomplished by applying voltage to the device while carefully controlling the supply current. The process takes between 2 and 20 hours, depending on voltage rating.

Damage to the oxide layer can occur due to a variety of reasons:

- Slitting of the anode foil after forming
- Attaching the tabs to the anode foil
- Minor mechanical damage caused during winding

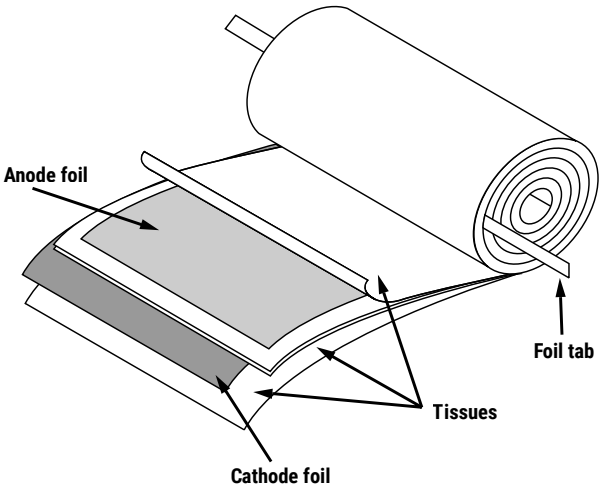
The following tests are applied for each individual capacitor.

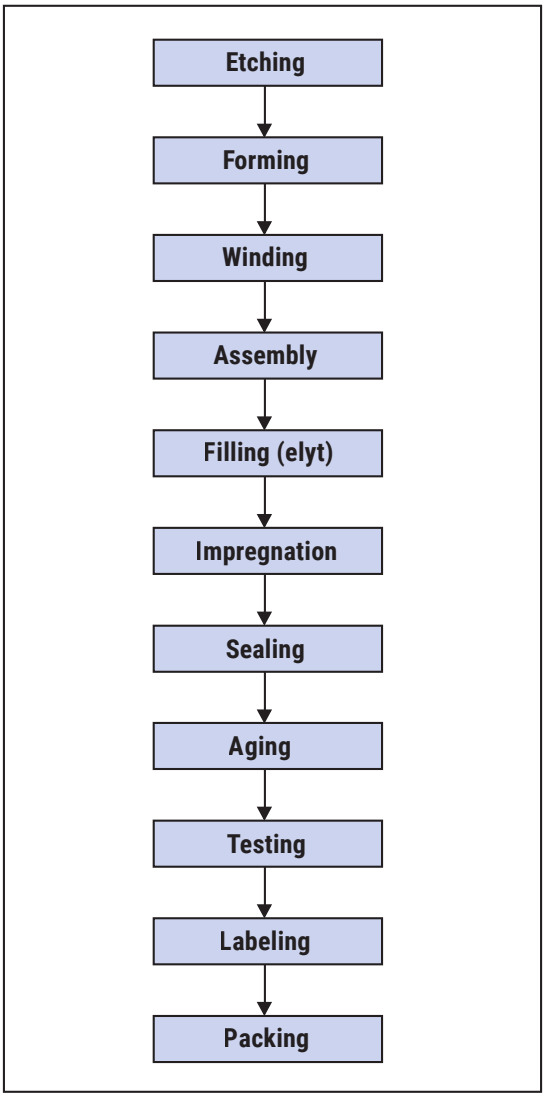
Electrical:

- Leakage current
- Capacitance
- ESR
- Tan Delta

Mechanical/Visual:

- Pull strength test of wire terminals
- Print detail
- Box labels
- Packaging, including packed quantity



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