PEG225 Series, +125ºC and +150ºC

Overview

KEMET's PEG225 is an electrolytic capacitor with outstanding electrical performance. The device has a polarized all-welded design, tinned copper wire leads, and a negative pole connected to the case. The PEG225 winding is housed in a cylindrical aluminum can with a high purity aluminum lid and high quality rubber gasket. Low ESR is the result of a low resistive electrolyte/paper system and an all-welded design. Thanks to its mechanical robustness, the PEG225 is suitable for use in mobile and aircraft installations with operation up to +150°C.

Applications

KEMET's PEG225 is a new generation of high performance axial electrolytic capacitors. It is designed for automotive applications with extremely high demands.

Benefits

- 4,000 hours at +150°C
- High CV
- Extremely high ripple current
- Up to 28 A ripple, RMS, continuous load
- High vibration resistance

Part Number System

PEG225	H	F	422	0	M
Series	Voltage (VDC)	Size Code	Capacitance Code (µF)	Version	Capacitance Tolerance
Axial Aluminum Electrolytic	H = 25 K = 40 M = 63	See Dimension Table	The second two digits indicate the two most significant digits of the capacitance value. The first digit indicates the total number digits.	0 = Standard	Q = -10 +30% M = ±20%

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Performance Characteristics

Item	Performance Characteristics	
Capacitance Range	470 – 6,300 µF	
Rated Voltage	25 – 63 VDC	
Temperature Range	-40 to +125°C (-40 to +150°C at derated voltage)	
Capacitance Tolerance	-10/+30%, (±20% select values) at 100 Hz/+20°C	
Shelf Life	5,000 hours at +105°C or 10 years at +40°C 0 VDC	
Leakage Current	I = 0.003 CV + 4,000 (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 and tan δ 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	100 Hz	300 Hz	1 kHz	5 kHz	100 kHz
Coefficient	0.35	0.57	0.80	1.00	1.04

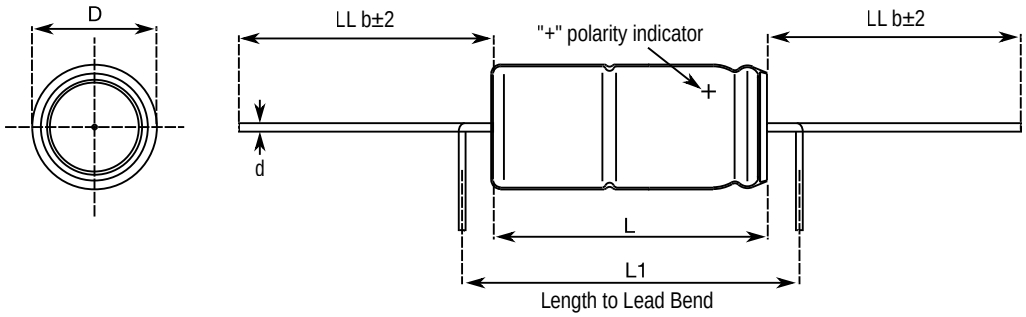
Test Method & Performance

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 (bag)	40 ±2	(Blank)

Dimensions – Millimeters



Size Code	Dimensions in mm				
	D	L	L1	d	LL
	±0.5	±1	Minimum	±0.03	b±2 Box
F	16	26.5	33	1.0	40
G	16	34.5	41	1.0	40
H	20	26.5	33	1.0	40
J	20	34.5	41	1.0	40
L	20	42.5	49	1.0	40

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 three years at 40°C. See sectional specification under each product series for specific data.

Re-age (Reforming) Procedure

Apply the rated voltage to the capacitor at room temperature for a period of one hour, or until the leakage current has fallen to a steady value below the specified limit. During re-aging a maximum charging current of twice the specified leakage current or 5 mA (whichever is greater) is suggested.

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; thus, 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.

Reliability as a function of time, R(t), is normally expressed as: $R(t)=e^{-\lambda t}$
where R(t) is the probability that the component will perform satisfactorily for time t, and λ is the failure rate.

Failure Rate

The failure rate is the number of components failing per unit time. The failure rate of most electronic components follows the characteristic pattern:

- Early failures are removed during the manufacturing process.
- The operational life is characterized by a constant failure rate.
- The wear out period is characterized by a rapidly increasing failure rate.

The failures in time (FIT) are given with a 60% confidence level for the various type codes. By convention, FIT is expressed as 1×10^{-9} failures per hour. Failure rate is also expressed as a percentage of failures per 1,000 hours.
e.g., 100FIT = 1×10^{-7} failures per hour = 0.01%/1,000 hours

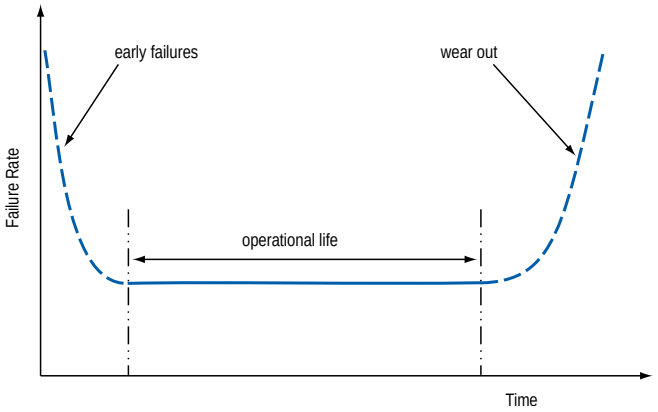
End of Life Definition
Catastrophic Failure: short circuit, open circuit or safety vent operation
Parametric Failure:

- Change in capacitance > ±10%
- Leakage current > specified limit
- ESR > 2 x initial ESR value

Failure Rate cont'd

MTBF

The mean time between failures (MTBF) is simply the inverse of the failure rate.
MTBF= 1/λ



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 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.

Because of customer requirements, there may appear additional markings such as LF = Lead Free or LFW = Lead Free Wires on the label.

Pb
RoHS Compliant

Table 1 – Ratings & Part Number Reference

VDC	VDC	Rated Capacitance	Size Code	Case Size	Ripple Current					ESR Maximum			Part Number
					Maximum			Rated	Maximum (Reduced Voltage)				
	(150°C)	100 Hz 20°C (µF)		D x L (mm)	≥ 5 kHz 125°C (A)[1]	≥ 5 kHz 140°C (A)[2]	≥ 5 kHz 150°C (A)[3]	≥ 5 kHz 125°C (A)[4]	≥ 5 kHz 125°C (A)[4]	100 Hz 20°C (mΩ)	100 kHz 20°C (mΩ)	5 – 100 kHz 125 – 150°C (mΩ)	
25	18	2200	F	16 x 27	17.3	11.0	4.9	6.1	7.7	60	34	11.9	PEG225HF4220M
25	18	3000	G	16 x 35	19.7	12.5	5.6	7.4	9.4	44	25	9.2	PEG225HG4300M
25	18	3600	H	20 x 27	23.5	14.9	6.7	7.6	9.6	38	22	9.4	PEG225HH4360Q
25	18	4800	J	20 x 35	26.7	16.9	7.6	9.2	11.7	28	16	7.3	PEG225HJ4480Q
25	18	6300	L	20 x 43	28.3	17.9	8.0	10.2	12.9	24	14	6.5	PEG225HL4630Q
40	32	1200	F	16 x 27	16.6	10.5	4.7	5.8	7.4	80	36	13	PEG225KF4120M
40	32	1800	G	16 x 35	19.3	12.2	5.5	7.2	9.2	55	25	9.6	PEG225KG4180M
40	32	2000	H	20 x 27	22.8	14.4	6.5	7.3	9.3	50	23	10	PEG225KH4200Q
40	32	3000	J	20 x 35	25.8	16.3	7.3	8.9	11.3	35	17	7.8	PEG225KJ4300Q
40	32	3900	L	20 x 43	27.7	17.5	7.8	10.0	12.7	28	14	6.8	PEG225KL4390Q
63	54	470	F	16 x 27	12.1	7.7	3.4	4.2	5.3	156	52	24.3	PEG225MF3470Q
63	54	680	G	16 x 35	13.8	8.7	3.9	5.3	6.7	109	37	18.7	PEG225MG3680Q
63	54	900	H	20 x 27	18.0	11.4	5.1	5.8	7.3	86	31	16.1	PEG225MH3900Q
63	54	1400	J	20 x 35	20.9	13.2	5.9	7.3	9.2	57	22	11.9	PEG225MJ4140Q
63	54	1800	L	20 x 43	22.8	14.4	6.5	8.3	10.5	45	18	10	PEG225ML4180Q
VDC	VDC (150°C)	Rated Capacitance	Size Code	Case Size	Ripple Current					ESR			Part Number

[1] *Capacitor-mounted with low thermal resistance path (heat-sink).*

[2] *Valid for capacitor supplied with reduced DC voltage, capacitor-mounted with low thermal resistance path.*

[3] *Continuous operation at natural convection (D=20, 4,000h; D=16 3,000h).*

[4] *Reduced Life (D=20, 2000h; D=16, 1500h).*

Packaging Quantities

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

Print Detail

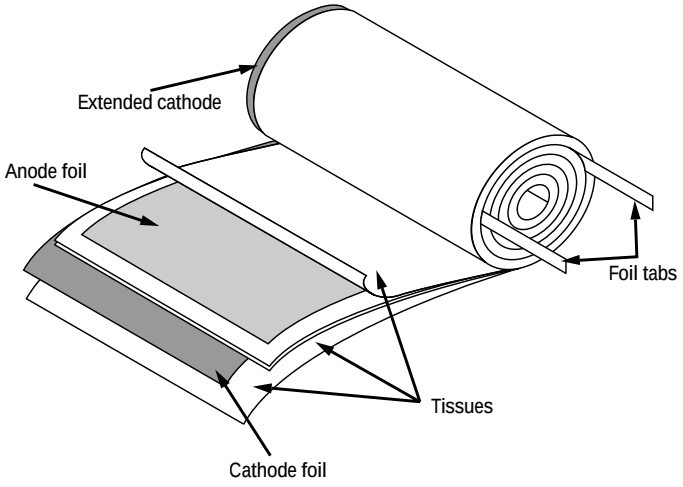
Standard Marking for PEG and PEH types

- KEMET Logo
- Rated capacitance
- Capacitance tolerance
- Rated voltage
- Date code
- Polarity indication
- Article code

Roll Over for Order Info.

Construction

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 deck, complete with terminals, is attached to the tabs and then folded down to rest on top of the winding. The complete winding is impregnated with electrolyte before being housed in a suitable container, usually an aluminum can, and 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 sleeved and 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 normally carried out at the rated temperature of the capacitor and is accomplished by applying voltage to the device while carefully controlling the supply current. The process may take several hours to complete.

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

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

A sample from each batch is taken by the quality department after completion of the production process.

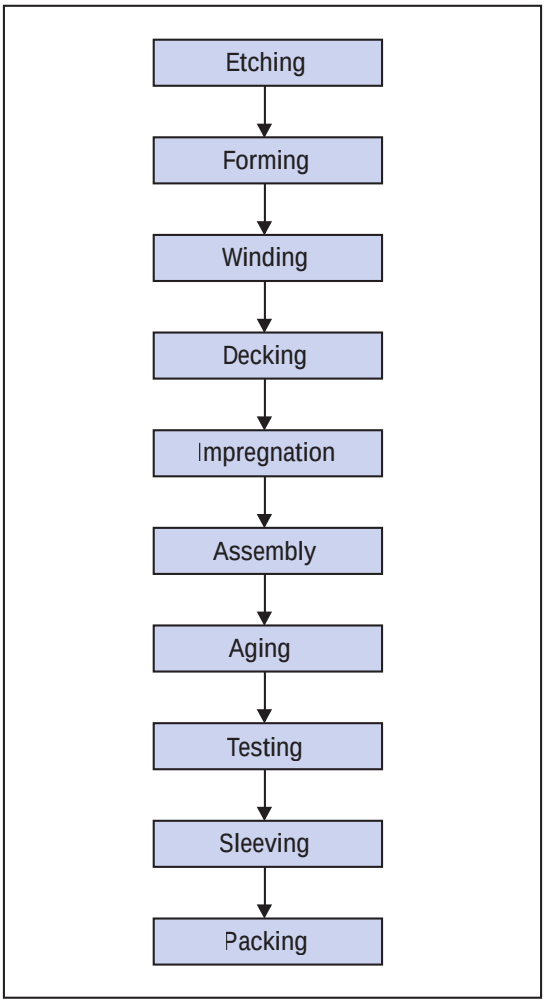
The following tests are applied and may be varied at the request of the customer. In this case the batch, or special procedure, will determine the course of action.

Electrical:

- Leakage current
- Capacitance
- ESR
- Impedance
- Tan Delta

Mechanical/Visual:

- Overall dimensions
- Torque test of mounting stud
- Print detail
- Box labels
- Packaging, including packed quantity



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Other KEMET Resources

Tools	
Resource	Location
Configure A Part: CapEdge	http://capacitoredge.kemet.com
SPICE & FIT Software	http://www.kemet.com/spice
Search Our FAQs: KnowledgeEdge	http://www.kemet.com/keask
Electrolytic LifeCalculator	http://www.kemet.com:8080/elc

Product Information	
Resource	Location
Products	http://www.kemet.com/products
Technical Resources (Including Soldering Techniques)	http://www.kemet.com/technicalpapers
RoHS Statement	http://www.kemet.com/rohs
Quality Documents	http://www.kemet.com/qualitydocuments

Product Request	
Resource	Location
Sample Request	http://www.kemet.com/sample
Engineering Kit Request	http://www.kemet.com/kits

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

Digitally signed by Jeannette Calvo
DN: c=US, st=FL, l=Fort Lauderdale, o=KEMET Corp., ou=Marketing Communications, cn=Jeannette Calvo, email=jeannettecalvo@kemet.com
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