

## Overview

KEMET's PEH526 is an electrolytic capacitor with outstanding electrical performance. The device is polarized, has a negative pole connected to the case and a plastic cover for the outer case.

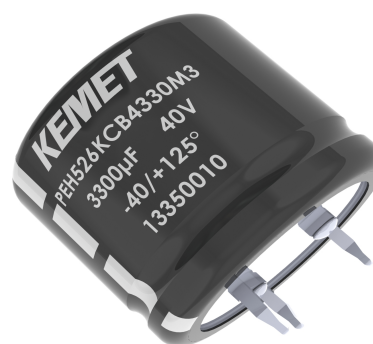
Low ESR is the result of a low resistive electrolyte/paper system. Together with the TDC thermal concept, this range gives the PEH526 a very high ripple current capability. It is suitable for use in both mobile and aircraft applications with operation up to +125°C.

## Applications

KEMET's PEH526 is a high performance electrolytic capacitor designed for automotive applications with high vibrations and high ambient temperatures.

## Benefits

- Designed for automotive applications
- 3,000 hours at +125°C ( $V_R$ ,  $I_R$  applied)
- Resistance to vibrations
- Low ESR
- High ripple current capability



## Part Number System

| PEH526                                   | H                          | AB                     | 427                                                                                                                     | 0            | M                     | 3           |
|------------------------------------------|----------------------------|------------------------|-------------------------------------------------------------------------------------------------------------------------|--------------|-----------------------|-------------|
| Series                                   | Rated Voltage (VDC)        | Size Code              | Capacitance Code (µF)                                                                                                   | Version      | Capacitance Tolerance | Termination |
| Snap-In type<br>Aluminum<br>Electrolytic | H = 25<br>K = 40<br>M = 63 | See Dimension<br>Table | The last two<br>digits represent<br>significant figures.<br>The first digit<br>specifies the total<br>number of digits. | 0 = Standard | M = ±20%              | 3 = 3 Pin   |

## Performance Characteristics

| Item                          | Performance Characteristics                                                                                                                           |                                                    |                                                                                                                                    |                                 |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| Capacitance Range             | 820 – 6,800 μF                                                                                                                                        |                                                    |                                                                                                                                    |                                 |
| Rated Voltage                 | 25 – 80 VDC                                                                                                                                           |                                                    |                                                                                                                                    |                                 |
| Operating Temperature         | -40 to +125°C                                                                                                                                         |                                                    |                                                                                                                                    |                                 |
| Capacitance Tolerance         | ±20% at 100 Hz/+20°C                                                                                                                                  |                                                    |                                                                                                                                    |                                 |
| Operational Lifetime          | D (mm)                                                                                                                                                | Rated Voltage and Ripple Current at +125°C (hours) | Rated Voltage at +125°C (hours)                                                                                                    | Rated Voltage at +105°C (hours) |
|                               | 22 – 30                                                                                                                                               | 3,000                                              | 4,000                                                                                                                              | 20,000                          |
| Shelf Life                    | 5,000 hours at 105°C or 10 years at +40°C 0 VDC                                                                                                       |                                                    |                                                                                                                                    |                                 |
| Leakage Current               | I = 0.01 CV (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                                                                                                       |                                                    |                                                                                                                                    |                                 |

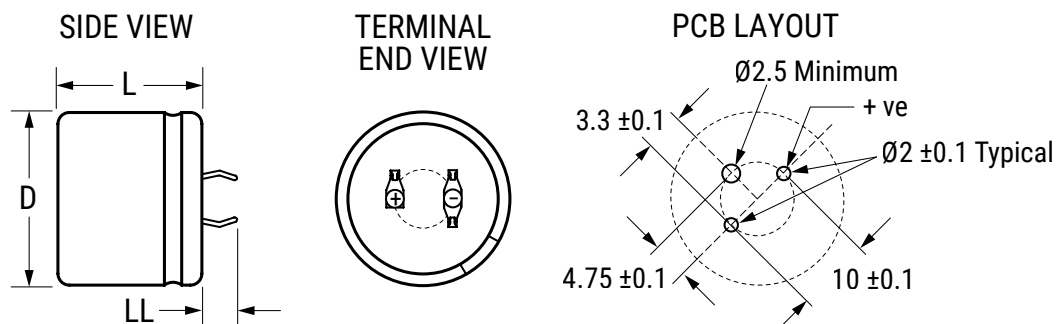
## Compensation Factor of Ripple Current (RC) vs. Frequency

|             |        |       |       |         |
|-------------|--------|-------|-------|---------|
| Frequency   | 300 Hz | 1 kHz | 5 kHz | 100 kHz |
| Coefficient | 0.70   | 0.89  | 1.00  | 1.03    |

## Test Method & Performance

| Endurance Life Test          |                                                                                                  |
|------------------------------|--------------------------------------------------------------------------------------------------|
| Conditions                   | Performance                                                                                      |
| Temperature                  | +125°C                                                                                           |
| Test Duration                | 4,000 hours                                                                                      |
| 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 |
| <b>Performance</b>           | <b>The following specifications will be satisfied when the capacitor is tested at +20°C:</b>     |
| Capacitance Change           | Within 15% of the initial value                                                                  |
| Equivalent Series Resistance | Does not exceed 300% of the specified limit                                                      |
| Leakage Current              | Does not exceed leakage current limit                                                            |

## Dimensions – Millimeters



| Size Code | Dimensions in mm |    |    | Approximate Weight Grams |
|-----------|------------------|----|----|--------------------------|
|           | D                | L  | LL |                          |
|           | ±0.5             | ±1 | ±1 |                          |
| AB        | 22               | 25 | 4  | 12                       |
| AC        | 22               | 30 | 4  | 14                       |
| BB        | 25               | 25 | 4  | 19                       |
| BD        | 25               | 35 | 4  | 24                       |
| CB        | 30               | 25 | 4  | 24                       |
| CD        | 30               | 35 | 4  | 34                       |

Note: Add 0.5 mm to D and 1 mm to L for Slewing

## 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  $\lambda$  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  $1 \times 10^{-9}$  failures per hour. Failure rate is also expressed as a percentage of failures per 1,000 hours.

e.g., 100 FIT =  $1 \times 10^{-7}$  failures per hour = 0.01%/1,000 hours

## End of Life Definition

Catastrophic Failure: short circuit, open circuit or safety vent operation

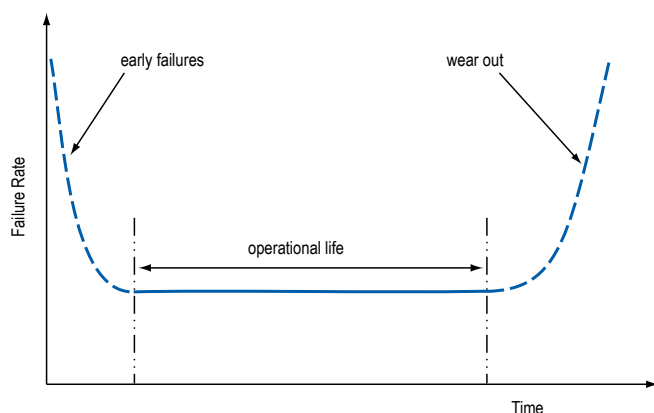
Parametric Failure:

- Change in capacitance  $> \pm 10\%$
- Leakage current  $>$  specified limit
- ESR  $> 2 \times$  initial ESR value

## MTBF

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

$$\text{MTBF} = 1/\lambda$$



## Environmental Compliance



All Part Numbers in this datasheet are Reach and RoHS compliant.

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 such as 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 worldwide 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   | Case Size  | Ripple Current Maximum |                     |                      |                      | ESR Maximum         |                      |                       | Part Number     |
|-----|---------------------|------------|------------------------|---------------------|----------------------|----------------------|---------------------|----------------------|-----------------------|-----------------|
|     | 100 Hz<br>20°C (µF) | D x L (mm) | 100 Hz<br>125°C (A)    | ≥ 5 kHz<br>85°C (A) | ≥ 5 kHz<br>105°C (A) | ≥ 5 kHz<br>125°C (A) | 100 Hz<br>20°C (mΩ) | 100 kHz<br>20°C (mΩ) | ≥ 5 kHz<br>125°C (mΩ) |                 |
| 25  | 2700                | 22 x 25    | 2.0                    | 9.7                 | 7.4                  | 3.7                  | 54                  | 30                   | 14                    | PEH526HAB4270M3 |
| 25  | 3900                | 22 x 30    | 2.5                    | 11.9                | 9.1                  | 4.5                  | 38                  | 22                   | 10                    | PEH526HAC4390M3 |
| 25  | 3900                | 25 x 25    | 2.3                    | 10.1                | 7.7                  | 3.8                  | 41                  | 24                   | 14                    | PEH526HBB4390M3 |
| 25  | 5600                | 30 x 25    | 2.7                    | 10.2                | 7.8                  | 3.8                  | 33                  | 22                   | 17                    | PEH526HCB4560M3 |
| 25  | 6800                | 25 x 35    | 3.4                    | 14.4                | 11.0                 | 5.5                  | 24                  | 14                   | 9                     | PEH526HBD4680M3 |
| 40  | 1200                | 22 x 25    | 1.5                    | 9.4                 | 7.2                  | 3.6                  | 77                  | 28                   | 15                    | PEH526KAB4120M3 |
| 40  | 1500                | 22 x 30    | 1.8                    | 11.5                | 8.8                  | 4.4                  | 59                  | 20                   | 11                    | PEH526KAC4150M3 |
| 40  | 1500                | 25 x 25    | 1.7                    | 9.8                 | 7.5                  | 3.7                  | 62                  | 23                   | 16                    | PEH526KBB4150M3 |
| 40  | 1800                | 22 x 25    | 1.7                    | 9.6                 | 7.3                  | 3.7                  | 62                  | 28                   | 14                    | PEH526KAB4180M3 |
| 40  | 1800                | 25 x 35    | 2.5                    | 14.1                | 10.7                 | 5.3                  | 36                  | 14                   | 9                     | PEH526KBD4180M3 |
| 40  | 2200                | 22 x 30    | 2.0                    | 11.7                | 8.9                  | 4.5                  | 49                  | 22                   | 11                    | PEH526KAC4220M3 |
| 40  | 2200                | 25 x 25    | 1.9                    | 10.0                | 7.6                  | 3.8                  | 52                  | 24                   | 15                    | PEH526KBB4220M3 |
| 40  | 2200                | 30 x 25    | 2.1                    | 9.8                 | 7.4                  | 3.7                  | 48                  | 22                   | 19                    | PEH526KCB4220M3 |
| 40  | 2700                | 25 x 35    | 2.5                    | 14.1                | 10.7                 | 5.3                  | 36                  | 14                   | 9                     | PEH526KBD4270M3 |
| 40  | 3300                | 30 x 25    | 2.4                    | 10.0                | 7.6                  | 3.8                  | 40                  | 22                   | 18                    | PEH526KCB4330M3 |
| 40  | 3900                | 25 x 35    | 2.8                    | 14.3                | 10.9                 | 5.4                  | 30                  | 14                   | 9                     | PEH526KBD4390M3 |
| 63  | 820                 | 22 x 25    | 1.2                    | 5.9                 | 4.6                  | 2.3                  | 150                 | 79                   | 36                    | PEH526MAB382AM3 |
| 63  | 1200                | 22 x 30    | 1.5                    | 7.4                 | 5.7                  | 2.9                  | 100                 | 55                   | 26                    | PEH526MAC412AM3 |
| 63  | 1200                | 25 x 25    | 1.5                    | 6.8                 | 5.3                  | 2.6                  | 110                 | 59                   | 31                    | PEH526MBB412AM3 |
| 63  | 1800                | 30 x 25    | 1.8                    | 7.7                 | 5.9                  | 2.9                  | 76                  | 45                   | 29                    | PEH526MCB418AM3 |
| 63  | 2200                | 25 x 35    | 2.2                    | 10.0                | 7.7                  | 3.8                  | 59                  | 34                   | 18                    | PEH526MBD422AM3 |
| VDC | Rated Capacitance   | Case Size  | Ripple Current         |                     |                      |                      | ESR                 |                      |                       | Part Number     |

80 VDC available upon request. Contact KEMET for details.

## Operational Life

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

Example:

Article: PEH526KBB4220M3

Ambient temperature ( $T_a$ ): +105°C

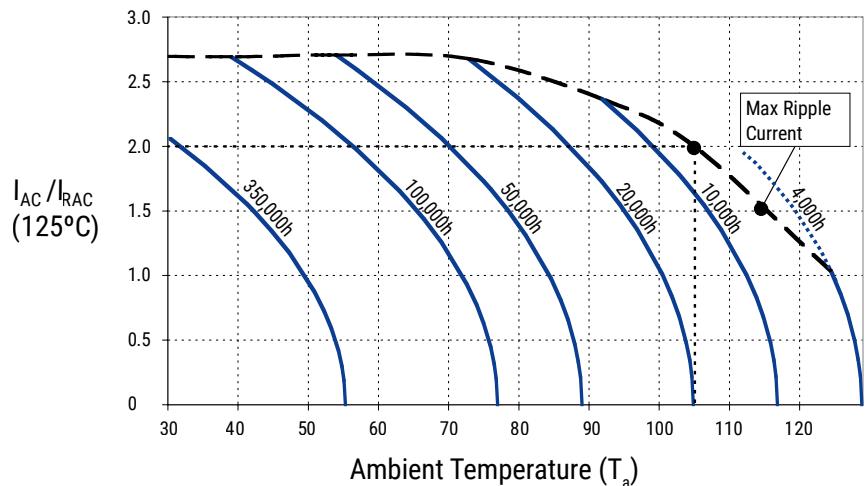
Ripple current, at 10 kHz ( $I_{AC}$ ): 7.8 A

$I_{RAC}(125^\circ\text{C}, \geq 5 \text{ kHz}) = 3.9 \text{ A}$  (from data table)

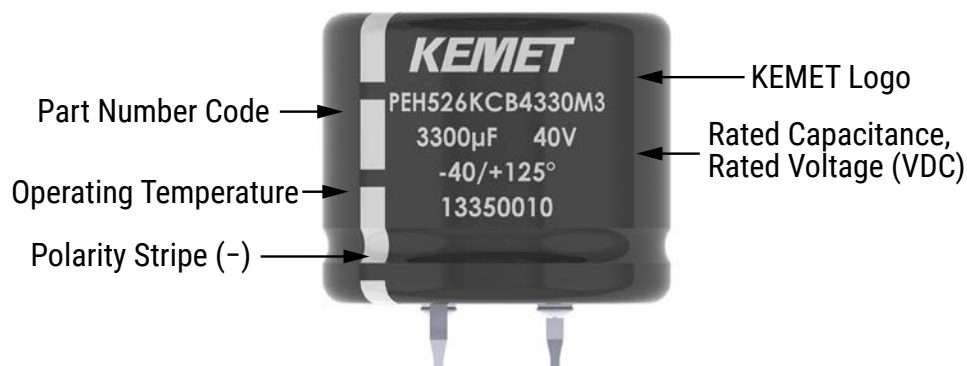
$\rightarrow I_{AC} / I_{RAC}(+125^\circ\text{C}) = 2.0$

Operational life: Interpolation between the

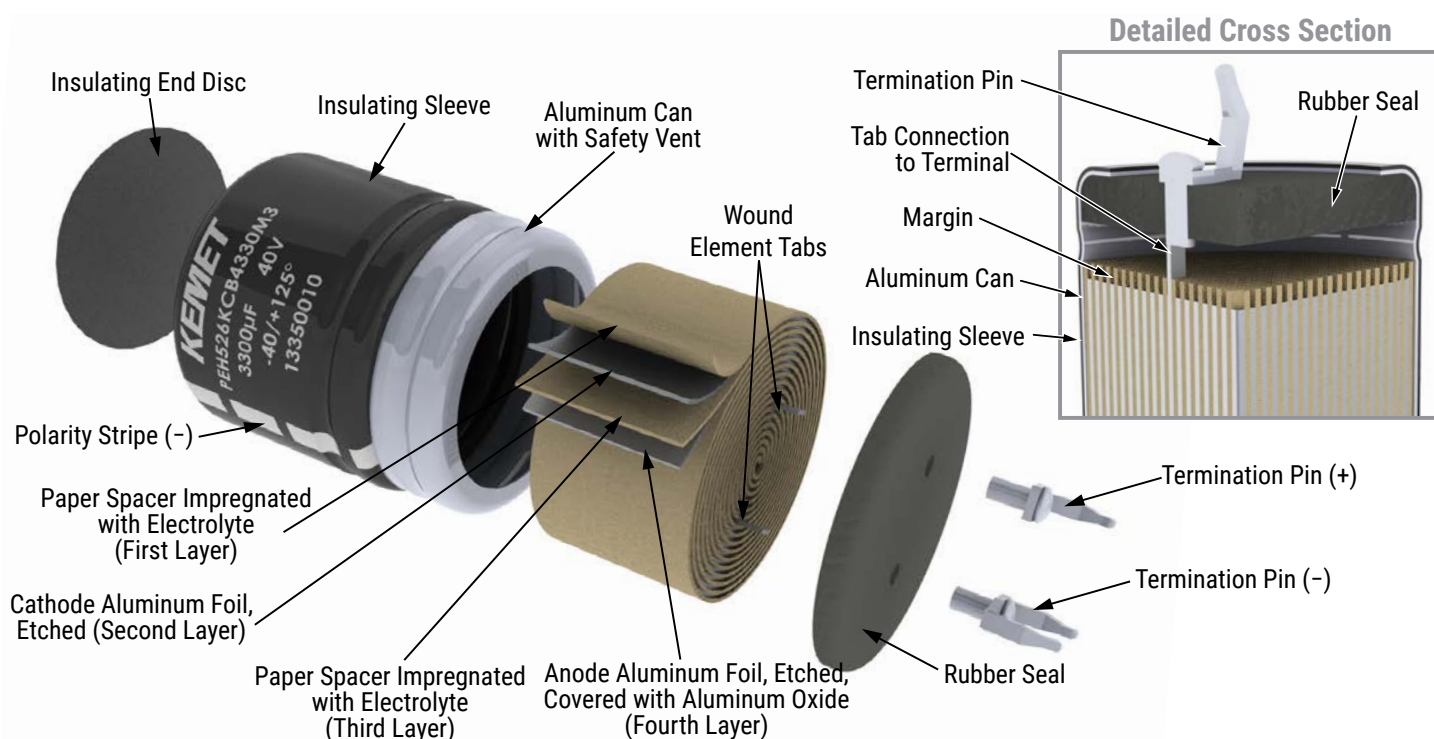
$L_{op}$ -curves  $\rightarrow L_{op} \sim 8 \text{ kh}$  (blue curves)



## 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 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.

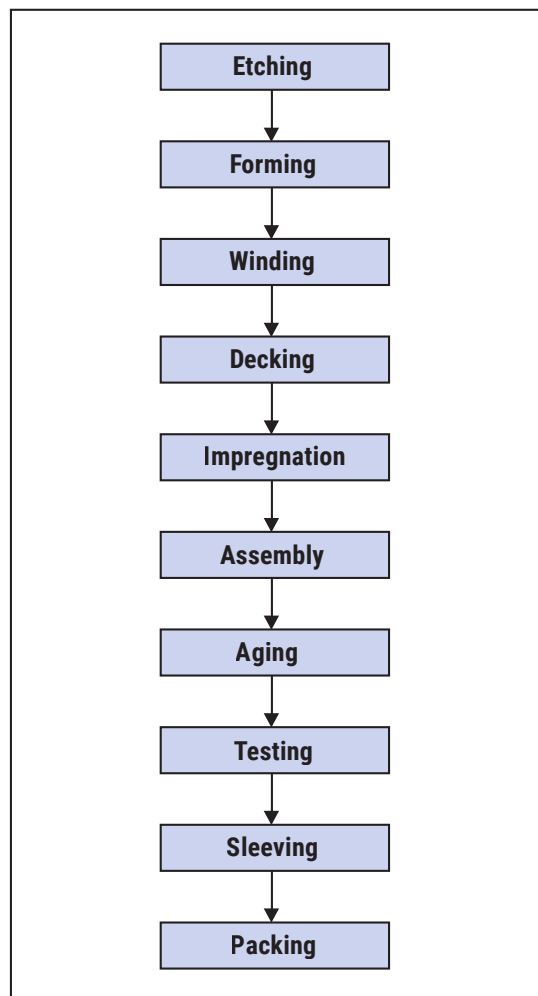
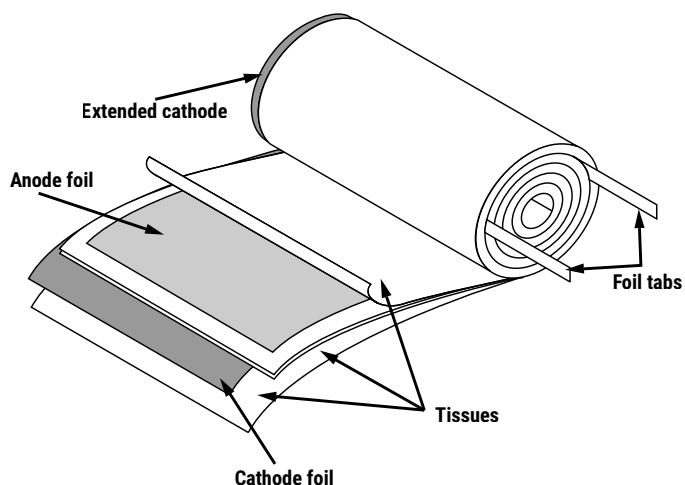
The following tests are applied and may be varied at the request of the customer. In this case the batch, or special procedure, will determine the course of action.

### 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



## KEMET Electronics Corporation Sales Offices

For a complete list of our global sales offices, please visit [www.kemet.com/sales](http://www.kemet.com/sales).

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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 indicated or that other measures may not be required.

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