

## Overview

The C4G capacitor is a polypropylene metallized film capacitor with a polyester tape wrapping filled with resin, and uses tinned copper wires.

## Applications

Typical applications include clamping, blocking, coupling/decoupling, AC harmonic filtering, and low power.

## Benefits

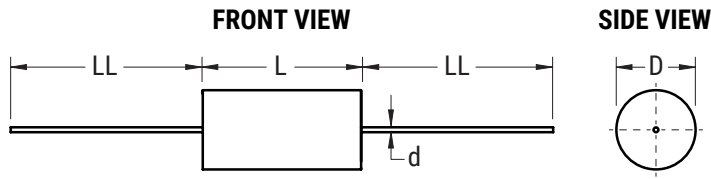
- Self-healing
- Low loss
- High ripple current
- High contact reliability
- Suitable for high frequency applications
- PP metallized



## Part Number System

| C4                  | G                                     | A  | D   | U  | B                             | 4100  | AA  | 4  | J                 |
|---------------------|---------------------------------------|--|---|--|-------------------------------|---|---|--|-------------------|
| Series              | Type                                  | Fire Protection  | Rated Voltage (VDC)                                 | Insulation   | Lead Diameter (mm)            | Capacitance Code (pF)   | Packaging   | Capacitor Length (mm)                            | Tolerance         |
| C4 = MKP Capacitors | G = Round body, switching application | A = No fire retardant<br>S = Fire retardant (on request) | D = 250<br>F = 400<br>H = 600<br>J = 700<br>M = 850 | U = Polyester tape and resin protection<br>0 = Uninsulated (upon request, but not in combination with Fire Protection "S") | B = 0.8<br>C = 1.0<br>D = 1.2 | Digits 2 – 4 indicate the first three digits of the capacitance value. First digit indicates the number of zeros to be added. | AA = Bulk (Bag) – straight leads see Dimensions Table | 4 = 20.5<br>5 = 28<br>0 = 33<br>1 = 44<br>3 = 58 | J = 5%<br>K = 10% |

## Dimensions – Millimeters



| <b>D</b>    | <b>L</b> | <b>d</b> | <b>LL</b> |
|-------------|----------|----------|-----------|
| Maximum     | Maximum  | Nominal  | $\pm 5$   |
| 11          | 20.5     | 0.8      | 40        |
| 9.5         | 28       | 0.8      | 40        |
| 10 – 13     | 33       | 0.8      | 40        |
| 13.5 – 20.5 | 33       | 1        | 40        |
| 18 – 22.5   | 44       | 1        | 40        |
| 23.5 – 33   | 44       | 1.2      | 40        |
| 28 – 35     | 58       | 1.2      | 40        |

## Qualification

|                               |                               |
|-------------------------------|-------------------------------|
| Reference Standards           | VDE 0560, IEC 61071, EN 61071 |
| Application Class (DIN 40040) | GPE/LS                        |
| Vibration Strength            | DIN 40040, Table 6, Class V   |

## Performance Characteristics

|  |  |
|--|--|
| Temperature Range  | -40°C to +85°C   |
| Maximum Permissible Ambient Temperature                                | +70°C  |
| IEC Climatic Category  | 40/85/56 according to IEC 68-1   |
| Peak Non-Repetitive Maximum Current                                    | $I_{PKR} \times 1.5$   |
| Test Voltage Terminal to Terminal (VTT)                                | $2 V_n$ for 10 seconds   |
| Test Voltage Terminal to Case (VTC)                                    | 3 k VDC 50 Hz for 60 seconds   |
| Insulation Resistance Test Conditions                                  | Temperature: +25°C ±5%<br>Voltage charge time: 1 minute<br>Test voltage: 100 VDC<br>Typical value (Ris x C): 3,000 seconds |
| Dissipation Factor (DF)  | $\leq 5 \times 10^{-4}$ at 1 kHz and 20°C  |
| Capacitance Deviation in Operating Temperature Range of -40°C to +85°C | ±1.5% maximum on capacitance value measured at +20°C   |
| Life Expectancy  | $\geq 30,000$ hours at $V_{RMS}$<br>$\geq 100,000$ hours at $V_n$  |
| Failure Quota  | 300/10 <sup>9</sup> components per hour  |
| Change of Capacitance vs. Operating Time                               | -3% after 30,000 hours at $V_{RMS}$<br>or after 100,000 hours at $V_n$   |
| Protection   | Polyester wrapping with epoxy resin fill   |
| Flame Retardant (IEC 384-1)  | Standard execution: non-flame retardant<br>On request: flame retardant execution Category C                                |
| Leads  | Tinned copper<br>(lead content = 5%)   |
| Installation   | Any position   |
| Damp Heat Test   | Test Conditions  |
|  | Relative humidity: 93% ±2%   |
|  | Temperature: +40°C   |
|  | Test duration: 56 days   |
|  | Capacitance change: $\leq \pm 5\%$   |
|  | DF change: $\leq 50\%$ of nominal value at 1 kHz   |
|  | Insulation resistance: $\geq 50\%$ of limit value  |

**Table 1 – Ratings & Part Number Reference**

| Cap Value (µF)         | VDC | VAC | Peak VDC | Maximum Dimensions (mm) |        | Ripple Current   | Peak Current | ESR (Maximum) | dV/dt (V/µs) | Packaging Quantity | Part Number           |
|------------------------|-----|-----|----------|-------------------------|--------|------------------|--------------|---------------|--------------|--------------------|-----------------------|
|                        |     |     |          | D                       | L      | 100 kHz 70°C (A) | (A)          | 100 kHz (mΩ)  |              |                    |                       |
| 1                      | 250 | 160 | 400      | 11                      | 20.5   | 6                | 60           | 6.7           | 60           | 500                | C4G(1)D(2)B4100AA4(3) |
| 2.2                    | 250 | 160 | 400      | 11.5                    | 33     | 6                | 66           | 10.9          | 30           | 300                | C4G(1)D(2)B4220AA0(3) |
| 2.5                    | 250 | 160 | 400      | 12                      | 33     | 7                | 75           | 9.8           | 30           | 300                | C4G(1)D(2)B4250AA0(3) |
| 3                      | 250 | 160 | 400      | 13.5                    | 33     | 8                | 90           | 8.2           | 30           | 250                | C4G(1)D(2)C4300AA0(3) |
| 3.3                    | 250 | 160 | 400      | 14                      | 33     | 9                | 99           | 7.5           | 30           | 250                | C4G(1)D(2)C4330AA0(3) |
| 4                      | 250 | 160 | 400      | 15.5                    | 33     | 9                | 120          | 6.4           | 30           | 200                | C4G(1)D(2)C4400AA0(3) |
| 5                      | 250 | 160 | 400      | 17                      | 33     | 9                | 150          | 5.4           | 30           | 150                | C4G(1)D(2)C4500AA0(3) |
| 6.8                    | 250 | 160 | 400      | 19.5                    | 33     | 9                | 204          | 4.4           | 30           | 100                | C4G(1)D(2)C4680AA0(3) |
| 10                     | 250 | 160 | 400      | 20                      | 44     | 9                | 200          | 5.3           | 20           | 100                | C4G(1)D(2)C5100AA1(3) |
| 15                     | 250 | 160 | 400      | 24.5                    | 44     | 12               | 300          | 3.9           | 20           | 50                 | C4G(1)D(2)D5150AA1(3) |
| 20                     | 250 | 160 | 400      | 28                      | 44     | 12               | 400          | 3.4           | 20           | 50                 | C4G(1)D(2)D5200AA1(3) |
| 25                     | 250 | 160 | 400      | 31                      | 44     | 12               | 500          | 3.1           | 20           | 50                 | C4G(1)D(2)D5250AA1(3) |
| 30                     | 250 | 160 | 400      | 29                      | 58     | 12               | 450          | 4             | 15           | 30                 | C4G(1)D(2)D5300AA3(3) |
| 40                     | 250 | 160 | 400      | 33.5                    | 58     | 12               | 600          | 3.5           | 15           | 30                 | C4G(1)D(2)D5400AA3(3) |
| 0.47                   | 400 | 250 | 600      | 9.5                     | 28     | 6                | 28           | 11.1          | 60           | 600                | C4G(1)F(2)B3470AA5(3) |
| 0.68                   | 400 | 250 | 600      | 10                      | 33     | 6                | 31           | 11.7          | 45           | 400                | C4G(1)F(2)B3680AA0(3) |
| 1                      | 400 | 250 | 600      | 12                      | 33     | 7                | 45           | 8.3           | 45           | 300                | C4G(1)F(2)B4100AA0(3) |
| 1.5                    | 400 | 250 | 600      | 14.5                    | 33     | 9                | 68           | 5.8           | 45           | 200                | C4G(1)F(2)C4150AA0(3) |
| 2                      | 400 | 250 | 600      | 16.5                    | 33     | 9                | 90           | 4.7           | 45           | 200                | C4G(1)F(2)C4200AA0(3) |
| 2.2                    | 400 | 250 | 600      | 17.5                    | 33     | 9                | 99           | 4.4           | 45           | 150                | C4G(1)F(2)C4220AA0(3) |
| 2.5                    | 400 | 250 | 600      | 18.5                    | 33     | 9                | 113          | 4             | 45           | 150                | C4G(1)F(2)C4250AA0(3) |
| 3                      | 400 | 250 | 600      | 20                      | 33     | 9                | 135          | 3.6           | 45           | 100                | C4G(1)F(2)C4300AA0(3) |
| 3.3                    | 400 | 250 | 600      | 18                      | 44     | 9                | 99           | 5.2           | 30           | 100                | C4G(1)F(2)C4330AA1(3) |
| 4                      | 400 | 250 | 600      | 19.5                    | 44     | 9                | 120          | 4.6           | 30           | 100                | C4G(1)F(2)C4400AA1(3) |
| 4.7                    | 400 | 250 | 600      | 21                      | 44     | 9                | 141          | 4.1           | 30           | 100                | C4G(1)F(2)C4470AA1(3) |
| 5                      | 400 | 250 | 600      | 21.5                    | 44     | 9                | 150          | 4             | 30           | 100                | C4G(1)F(2)C4500AA1(3) |
| 6.8                    | 400 | 250 | 600      | 25                      | 44     | 12               | 204          | 3.2           | 30           | 50                 | C4G(1)F(2)D4680AA1(3) |
| 10                     | 400 | 250 | 600      | 30                      | 44     | 12               | 300          | 2.7           | 30           | 50                 | C4G(1)F(2)D5100AA1(3) |
| 15                     | 400 | 250 | 600      | 31.5                    | 58     | 12               | 300          | 4.8           | 20           | 30                 | C4G(1)F(2)D5150AA3(3) |
| 20                     | 400 | 250 | 600      | 35                      | 58     | 12               | 400          | 4             | 20           | 30                 | C4G(1)F(2)D5200AA3(3) |
| 0.47                   | 600 | 330 | 800      | 11                      | 33     | 6                | 28           | 13.1          | 60           | 300                | C4G(1)H(2)B3470AA0(3) |
| 0.68                   | 600 | 330 | 800      | 13                      | 33     | 7                | 41           | 9.4           | 60           | 300                | C4G(1)H(2)B3680AA0(3) |
| 1                      | 600 | 330 | 800      | 15.5                    | 33     | 9                | 60           | 6.6           | 60           | 200                | C4G(1)H(2)C4100AA0(3) |
| 2                      | 600 | 330 | 800      | 18.5                    | 44     | 9                | 80           | 6.3           | 40           | 100                | C4G(1)H(2)C4200AA1(3) |
| 2.2                    | 600 | 330 | 800      | 19.5                    | 44     | 9                | 88           | 5.2           | 40           | 100                | C4G(1)H(2)C4220AA1(3) |
| 3                      | 600 | 330 | 800      | 22.5                    | 44     | 9                | 120          | 4.8           | 40           | 70                 | C4G(1)H(2)C4300AA1(3) |
| 3.3                    | 600 | 330 | 800      | 23.5                    | 44     | 12               | 132          | 4.3           | 40           | 70                 | C4G(1)H(2)D4330AA1(3) |
| 4                      | 600 | 330 | 800      | 25.5                    | 44     | 12               | 160          | 3.8           | 40           | 50                 | C4G(1)H(2)D4400AA1(3) |
| 4.7                    | 600 | 330 | 800      | 27.5                    | 44     | 12               | 188          | 3.5           | 40           | 50                 | C4G(1)H(2)D4470AA1(3) |
| 5                      | 600 | 330 | 800      | 28.5                    | 44     | 12               | 200          | 3.4           | 40           | 50                 | C4G(1)H(2)D4500AA1(3) |
| 6.8                    | 600 | 330 | 800      | 28.5                    | 58     | 12               | 204          | 6.8           | 30           | 30                 | C4G(1)H(2)D4680AA3(3) |
| 10                     | 600 | 330 | 800      | 34.5                    | 58     | 12               | 300          | 5.3           | 30           | 30                 | C4G(1)H(2)D5100AA3(3) |
| 0.47                   | 700 | 400 | 1,000    | 14.5                    | 33     | 8                | 38           | 9.5           | 80           | 200                | C4G(1)J(2)C3470AA0(3) |
| 0.68                   | 700 | 400 | 1,000    | 17                      | 33     | 9                | 55           | 7             | 80           | 150                | C4G(1)J(2)C3680AA0(3) |
| 1                      | 700 | 400 | 1,000    | 20.5                    | 33     | 9                | 80           | 5.2           | 80           | 100                | C4G(1)J(2)C4100AA0(3) |
| 1.5                    | 700 | 400 | 1,000    | 20.5                    | 44     | 9                | 90           | 6.4           | 60           | 100                | C4G(1)J(2)C4150AA1(3) |
| 2                      | 700 | 400 | 1,000    | 23.5                    | 44     | 12               | 120          | 5             | 60           | 70                 | C4G(1)J(2)D4200AA1(3) |
| 2.2                    | 700 | 400 | 1,000    | 24.5                    | 44     | 12               | 132          | 4.7           | 60           | 50                 | C4G(1)J(2)D4220AA1(3) |
| 3                      | 700 | 400 | 1,000    | 28.5                    | 44     | 12               | 180          | 3.9           | 60           | 50                 | C4G(1)J(2)D4300AA1(3) |
| 3.3                    | 700 | 400 | 1,000    | 30                      | 44     | 12               | 198          | 3.7           | 60           | 50                 | C4G(1)J(2)D4330AA1(3) |
| 4                      | 700 | 400 | 1,000    | 33                      | 44     | 12               | 240          | 3.5           | 60           | 50                 | C4G(1)J(2)D4400AA1(3) |
| 4.7                    | 700 | 400 | 1,000    | 29.5                    | 58     | 12               | 188          | 7.9           | 40           | 30                 | C4G(1)J(2)D4470AA3(3) |
| 5                      | 700 | 400 | 1,000    | 30.5                    | 58     | 12               | 200          | 7.5           | 40           | 30                 | C4G(1)J(2)D4500AA3(3) |
| 6.8                    | 700 | 400 | 1,000    | 35                      | 58     | 12               | 272          | 6.1           | 40           | 30                 | C4G(1)J(2)D4680AA3(3) |
| Capacitance Value (µF) | VDC | VAC | D (mm)   | D (mm)                  | L (mm) | Ripple Current   | Peak Current | ESR           | dV/dt (V/µs) | Packaging Quantity | Part Number           |

(1) A = No fire retardant; S = fire retardant (on request)

(2) U = Tape and resin protection; 0 = unprotected (upon request, but not in combination with Fire retardant code "S")

(3) K = ±10%, J = ±5%

**Table 1 – Ratings & Part Number Reference cont.**

| Cap Value (µF)         | VDC | VAC | Peak VDC | Maximum Dimensions (mm) |        | Ripple Current   | Peak Current | ESR (Maximum) | dV/dt (V/µs) | Packaging Quantity | Part Number           |
|------------------------|-----|-----|----------|-------------------------|--------|------------------|--------------|---------------|--------------|--------------------|-----------------------|
|                        |     |     |          | D                       | L      | 100 kHz 70°C (A) | (A)          | 100 kHz (mΩ)  |              |                    |                       |
| 0.15                   | 850 | 450 | 1,200    | 10                      | 33     | 5                | 32           | 14.5          | 210          | 400                | C4G(1)M(2)B3150AA0(3) |
| 0.22                   | 850 | 450 | 1,200    | 12                      | 33     | 7                | 46           | 10.3          | 210          | 300                | C4G(1)M(2)B3220AA0(3) |
| 0.33                   | 850 | 450 | 1,200    | 14.5                    | 33     | 9                | 69           | 7.1           | 210          | 200                | C4G(1)M(2)C3330AA0(3) |
| 0.47                   | 850 | 450 | 1,200    | 17                      | 33     | 9                | 99           | 5.4           | 210          | 150                | C4G(1)M(2)C3470AA0(3) |
| 0.68                   | 850 | 450 | 1,200    | 20.5                    | 33     | 9                | 143          | 4.2           | 210          | 100                | C4G(1)M(2)C3680AA0(3) |
| 1                      | 850 | 450 | 1,200    | 20.5                    | 44     | 9                | 140          | 4.7           | 140          | 100                | C4G(1)M(2)C4100AA1(3) |
| 1.5                    | 850 | 450 | 1,200    | 24.5                    | 44     | 12               | 210          | 3.5           | 140          | 70                 | C4G(1)M(2)D4150AA1(3) |
| 2                      | 850 | 450 | 1,200    | 28.5                    | 44     | 12               | 280          | 3.1           | 140          | 50                 | C4G(1)M(2)D4200AA1(3) |
| 2.2                    | 850 | 450 | 1,200    | 29.5                    | 44     | 12               | 308          | 3             | 140          | 50                 | C4G(1)M(2)D4220AA1(3) |
| 2.5                    | 850 | 450 | 1,200    | 31.5                    | 44     | 12               | 350          | 2.9           | 140          | 50                 | C4G(1)M(2)D4250AA1(3) |
| 3                      | 850 | 450 | 1,200    | 28                      | 58     | 12               | 270          | 3.6           | 90           | 30                 | C4G(1)M(2)D4300AA3(3) |
| 3.3                    | 850 | 450 | 1,200    | 29.5                    | 58     | 12               | 297          | 3.5           | 90           | 30                 | C4G(1)M(2)D4330AA3(3) |
| 4                      | 850 | 450 | 1,200    | 32.5                    | 58     | 12               | 360          | 3.2           | 90           | 30                 | C4G(1)M(2)D4400AA3(3) |
| Capacitance Value (µF) | VDC | VAC | D (mm)   | D (mm)                  | L (mm) | Ripple Current   | Peak Current | ESR           | dV/dt (V/µs) | Packaging Quantity | Part Number           |

(1) A = No fire retardant; S = fire retardant (on request)

(2) U = Tape and resin protection; 0 = unprotected (upon request, but not in combination with Fire retardant code "S")

(3) K = ±10%, J = ±5%

## Environmental Compliance

As a leading global supplier of electronic components and an environmentally conscious company, KEMET continually aspires to improve the environmental effects of our manufacturing processes and our finished electronic components.

In Europe (RoHS Directive) and in some other geographical areas such as China (China RoHS), legislation has been enacted to prevent or otherwise limit the use of certain hazardous materials, including lead (Pb), in electronic equipment. KEMET monitors legislation globally to ensure compliance and endeavors to adjust our manufacturing processes and/or electronic components as may be required by applicable law.

For military, medical, automotive, and some commercial applications, the use of lead (Pb) in the termination is necessary and/or required by design. KEMET is committed to communicating RoHS compliance to our customers. Information related to RoHS compliance will be provided in data sheets and using specific identifiers on the packaging labels.

All KEMET power film capacitors are RoHS compliant.

## Materials & Environment

The selection of raw materials that KEMET uses for the production of its electronic components is the result of extensive experience. KEMET directs specific attention toward environmental protection. KEMET selects its suppliers according to ISO 9001 standards and performs statistical analyses on raw materials before acceptance for use in manufacturing our electronic components. All materials are, to the best of KEMET's knowledge, non-toxic and free from cadmium; mercury; chrome and compounds; polychlorine triphenyl (PCB); bromide and chlorinedioxins bromurate clorurate; CFC and HCFC; and asbestos.

## Dissipation Factor

Dissipation factor is a complex function involved with capacitor inefficiency. The  $\tan\delta$  may vary up and down with increased temperature. For more information, refer to Performance Characteristics.

## Sealing

### Hermetically Sealed Capacitors

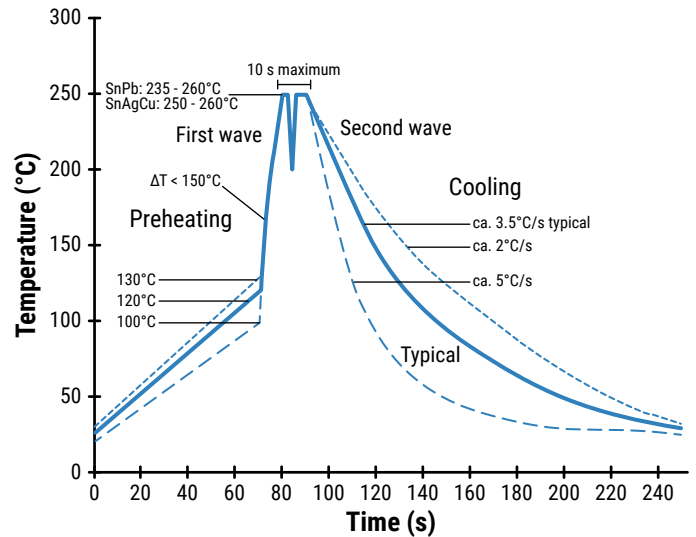
As the temperature increases, the pressure inside the capacitor increases. If the internal pressure is high enough, it can cause a breach in the capacitor. Such a breach can result in leakage, impregnation, filling fluid, or moisture susceptibility.

### Barometric Pressure

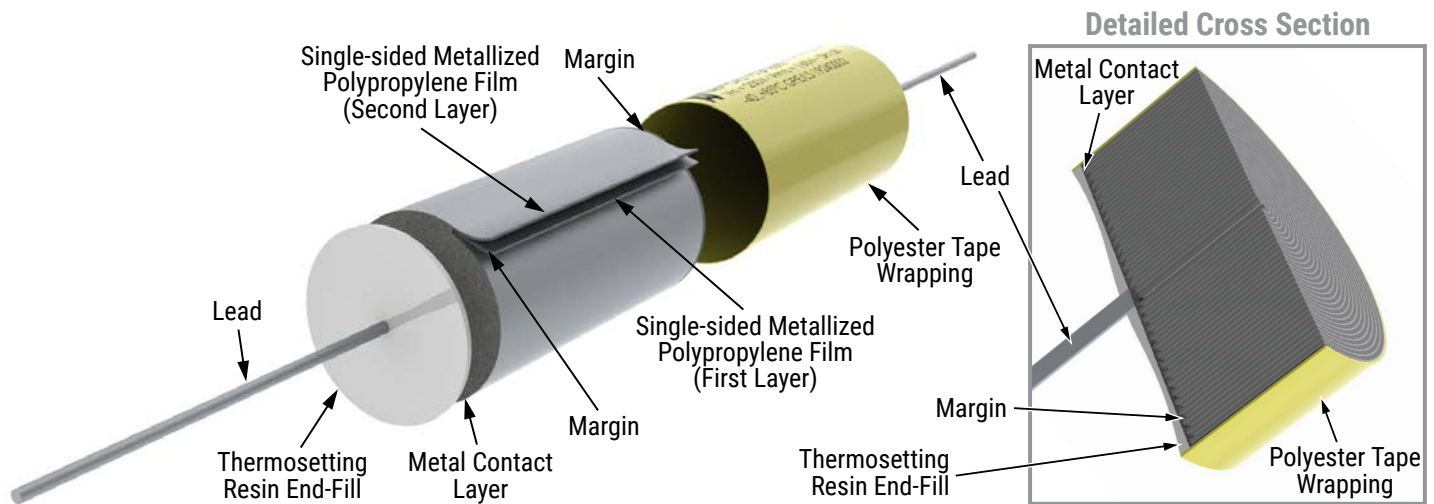
The altitude at which hermetically sealed capacitors are operated controls the capacitor's voltage rating. As the barometric pressure decreases, the susceptibility to terminal arc-over increases. Non-hermetic capacitors can be affected by internal stresses due to pressure changes. These effects can be in the form of capacitance changes, dielectric arc-over, and/or low insulation resistance. Altitude can also affect heat transfer. Heat that is generated in an operation cannot be dissipated properly, and high  $RI^2$  losses and eventual failure can result.

## Soldering Process

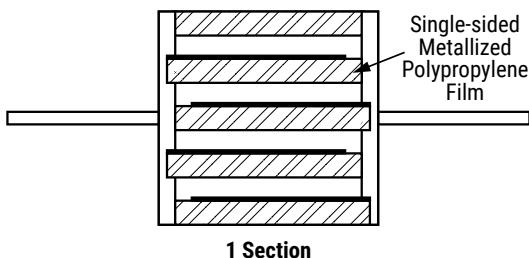
The implementation of the RoHS Directive has required the selection SnAgCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183°C for SnPb eutectic alloy to 217 – 221°C for the new alloys. As a result, the heat stress to components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive especially for mechanically small polypropylene capacitors (lead spacings 5 – 10 mm) and great care must be taken during soldering. The solder profiles from KEMET are highly recommended. You may also refer to the wave soldering curve from IEC Publication 61760-1 Edition 2. Please consult KEMET with any questions.



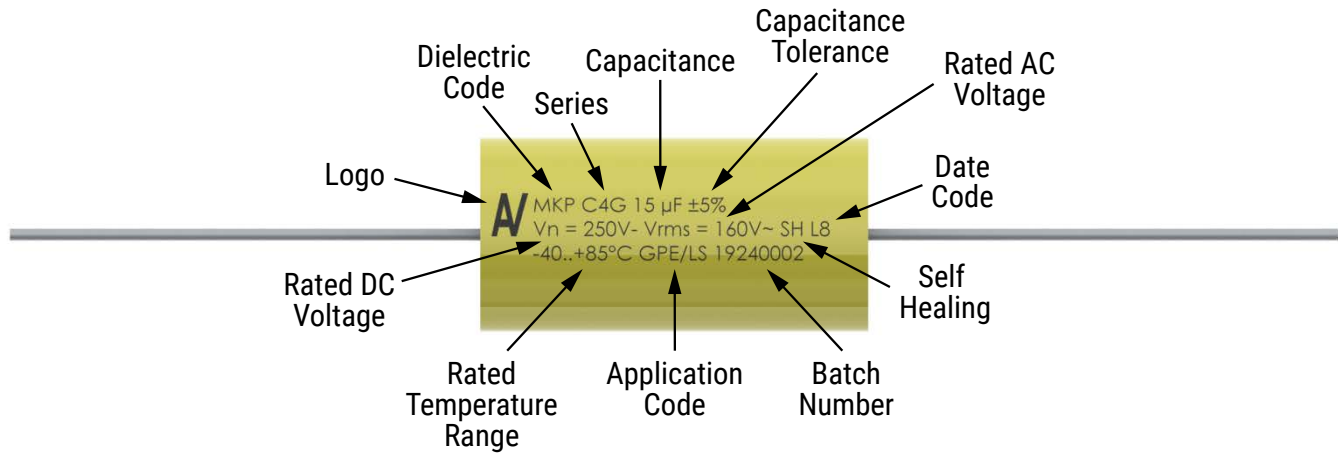
## Construction



## Winding Scheme



## Marking





## KEMET Electronics Corporation Sales Offices

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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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