

# C4AE, Radial, 2 or 4 Leads, 450 – 1,100 VDC for DC Link

## Overview

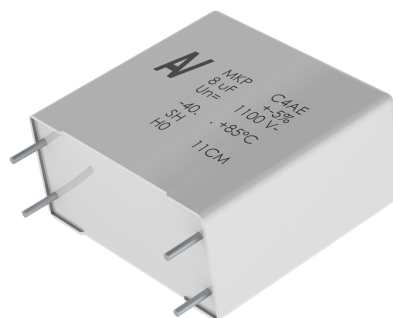
The C4AE capacitor is a polypropylene metallized film capacitor with a rectangular, plastic box-type design (white or grey in color) filled with resin, and uses 2 or 4 tinned copper wires.

## Applications

Typical applications include DC filtering and energy storage.

## Benefits

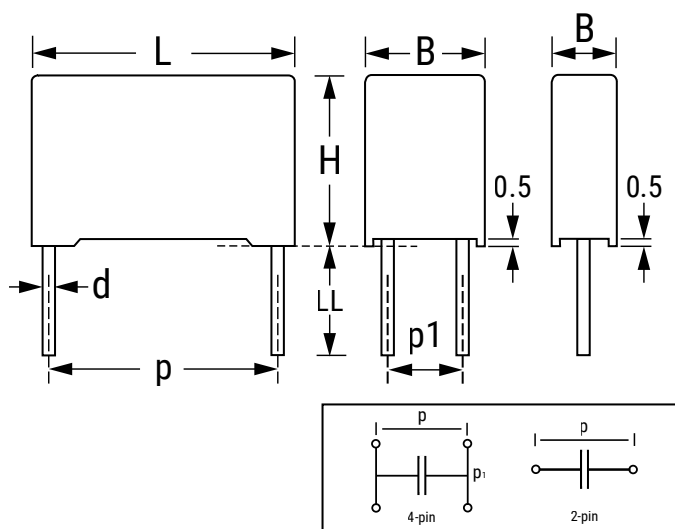
- Self-healing
- Low loss
- High ripple current
- High capacitance density
- High contact reliability
- Suitable for high frequency applications



## Part Number System

| C4                        | A                       | E           | Q                                                     | B                     | W                        | 5270                                                                                                                               | A                  | 3                             | N                                                                                                                                                                                                                                      | J                 |
|---------------------------|-------------------------|-------------|-------------------------------------------------------|-----------------------|--------------------------|------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| Series                    | Type                    | Application | Rated Voltage (VDC)                                   | Case                  | Terminals Code           | Capacitance Code (pF)                                                                                                              | C-Spec             | Lead Diameter (mm)            | Size Code: B x H x L (mm)                                                                                                                                                                                                              | Tolerance         |
| C4 = MKP Power Capacitors | A = Box, wire terminals | E = DC link | G = 450<br>H = 600<br>J = 700<br>O = 900<br>Q = 1,100 | B = Box, plastic case | U = 2 pins<br>W = 4 pins | Digits two – four indicate the first three digits of the capacitance value. First digit indicates the number of zeros to be added. | A = Standard grade | 1 = 0.8<br>2 = 1.0<br>3 = 1.2 | W = 11 x 20 x 31.5<br>X = 13 x 25 x 31.5<br>Y = 14 x 28 x 31.5<br>1 = 19 x 29 x 31.5<br>2 = 22 x 37 x 31.5<br>F = 20 x 40 x 42<br>H = 24 x 44 x 42<br>J = 28 x 37 x 42<br>L = 30 x 45 x 42<br>M = 30 x 45 x 57.5<br>N = 35 x 50 x 57.5 | J = 5%<br>K = 10% |

## Dimensions – Millimeters



| Size Code | p       |           | p1       |           | B       |           | H       |           | L       |           | LL      |           | d       |           |
|-----------|---------|-----------|----------|-----------|---------|-----------|---------|-----------|---------|-----------|---------|-----------|---------|-----------|
|           | Nominal | Tolerance | Nominal  | Tolerance | Nominal | Tolerance | Nominal | Tolerance | Nominal | Tolerance | Nominal | Tolerance | Nominal | Tolerance |
| W         | 27.5    | ±0.4      |          |           | 11      | +0.3      | 20      | +0.2      | 31.5    | +0.5      | 6       | +0/-2     | 0.8     | ±0.05     |
| X         | 27.5    | ±0.4      |          |           | 13      | +0.3      | 25      | +0.2      | 31.5    | +0.5      | 6       | +0/-2     | 0.8     | ±0.05     |
| Y         | 27.5    | ±0.4      |          |           | 14      | +0.3      | 28      | +0.2      | 31.5    | +0.5      | 6       | +0/-2     | 0.8     | ±0.05     |
| 1         | 27.5    | ±0.4      |          |           | 19      | +0.3      | 29      | +0.2      | 31.5    | +0.5      | 6       | +0/-2     | 0.8     | ±0.05     |
| 2         | 27.5    | ±0.4      |          |           | 22      | +0.3      | 37      | +0.2      | 31.5    | +0.5      | 6       | +0/-2     | 0.8     | ±0.05     |
| F         | 37.5    | ±0.4      | 5.1/10.2 | ±0.4      | 20      | +0.4      | 40      | +0.2      | 42.0    | +0.6      | 6       | +0/-2     | 1.2     | ±0.05     |
| H         | 37.5    | ±0.4      | 10.2     | ±0.4      | 24      | +0.4      | 44      | +0.2      | 42      | +0.6      | 6       | +0/-2     | 1.2     | ±0.05     |
| J         | 37.5    | ±0.4      | 10.2     | ±0.4      | 28      | +0.4      | 37      | +0.2      | 42.0    | +0.6      | 6       | +0/-2     | 1.2     | ±0.05     |
| L         | 37.5    | ±0.4      | 20.3     | ±0.4      | 30      | +0.4      | 45      | +0.2      | 42.0    | +0.6      | 6       | +0/-2     | 1.2     | ±0.05     |
| M         | 52.5    | ±0.4      | 20.3     | ±0.4      | 30      | +0.5      | 45      | +0.3      | 57.5    | +0.8      | 6       | +0/-2     | 1.2     | ±0.05     |
| N         | 52.5    | ±0.4      | 20.3     | ±0.4      | 35      | +0.5      | 50      | +0.3      | 57.5    | +0.8      | 6       | +0/-2     | 1.2     | ±0.05     |

## Qualifications

|                     |                                   |
|---------------------|-----------------------------------|
| Reference Standards | IEC 61071, EN61071, VDE0560       |
| Climatic Category   | 40/85/56 according to IEC 60068-1 |

## General Technical Data

|                               |                                                                                                                                                                                                                               |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Dielectric                    | Polypropylene metallized film - non inductive self-healing property                                                                                                                                                           |
| Application                   | DC filtering/DC-Link                                                                                                                                                                                                          |
| Climatic Category             | 40/85/56 IEC 60068-1                                                                                                                                                                                                          |
| Maximum Operating Temperature | +105°C                                                                                                                                                                                                                        |
| Endurance Test                | 500 hours + 500 hours at $1.3 \times V_{NDC}$ at 85°C                                                                                                                                                                         |
| Standard                      | IEC 61071 – EN61071 – VDE0560                                                                                                                                                                                                 |
| Protection                    | Solvent resistant plastic case UL94 V-0<br>Thermosetting resin sealing UL94 V-0 compliant                                                                                                                                     |
| Installation                  | Any position                                                                                                                                                                                                                  |
| Leads                         | Tinned copper wires – standard lead wire length 6 (+0/-2) mm                                                                                                                                                                  |
| Packaging                     | Packed in cardboard trays with protection for the terminals                                                                                                                                                                   |
| RoHS Compliant                | 'Compliant with Directive 2002/95/EC and Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011, including Commission Delegated Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU. |

## Electrical Characteristics

|                                              |                                                                                                                  |
|----------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| Rated Capacitance range                      | 1 to 130 $\mu$ F                                                                                                 |
| Rated Voltage (VNDC) range                   | 450 to 1,100 VDC                                                                                                 |
| Capacitance Tolerance                        | $\pm 5\%$ (J) or $\pm 10\%$ (K) measured at $T = +25^\circ\text{C}$                                              |
| Dissipation Factor PP typical (tg $\delta$ ) | $\leq 0.0002$ at 10 kHz with $T = 25^\circ\text{C} (\pm 5^\circ\text{C})$                                        |
| Surge Voltage                                | $1.5 * V_{NDC}$ for maximum 10 times in life time at $25^\circ\text{C}$                                          |
| Overvoltage (IEC 61071)                      | $1.15 * V_{NDC}$ for maximum 30 minute - once per day                                                            |
|                                              | $1.3 * V_{NDC}$ for maximum 1 minute - once per day                                                              |
| Peak Non-Repetitive Current                  | $1.5 * I_{PKR}$ - maximum 1,000 times in life time                                                               |
| Insulation Resistance                        | $IR \times C \geq 30.000$ seconds at 100 Vdc 1 minute ( $+25^\circ\text{C}$ )                                    |
| Capacitance deviation in operation           | $\pm 1.5\%$ maximum on capacitance value measured at $T = +25^\circ\text{C}$                                     |
| Temperature Storage                          | $-40$ to $+80^\circ\text{C}$                                                                                     |
| Storage time                                 | $\leq 36$ months from the date marked on the label glued to the package                                          |
| Permissible Relative Humidity - Storage      | Annual average $\leq 70\%$ ; 85% on 30 days/year randomly distributed throughout the year. Dewing not admissible |

## Life Expectancy

|                                 |                                                                                    |
|---------------------------------|------------------------------------------------------------------------------------|
| Life expectancy                 | 100.000 hours at $V_{NDC}$ at Hot spot temperature $T_{HS} = +85^{\circ}\text{C}$  |
| Capacitance drop at end of life | -5% (typical)                                                                      |
| Failure rate IEC 61709          | $\leq 300$ FIT at $V_{NDC}$ at Hot spot temperature $T_{HS} = +85^{\circ}\text{C}$ |

## Test Method

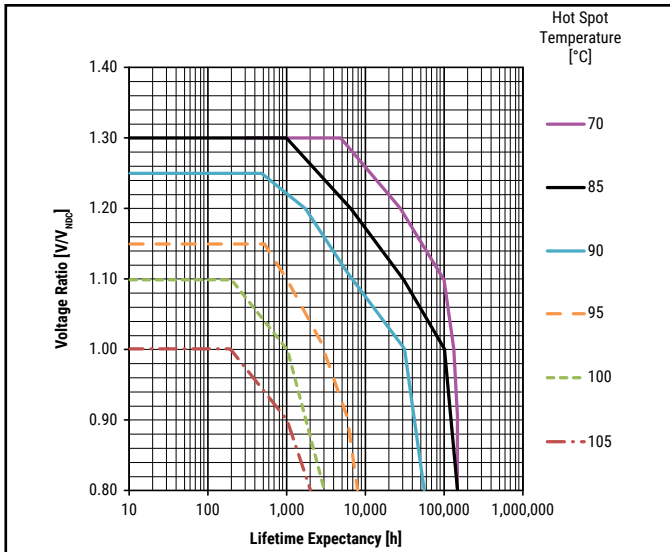
|                                         |                                                                                            |
|-----------------------------------------|--------------------------------------------------------------------------------------------|
| Test voltage between terminals          | $1.5 * V_{NDC}$ for 10 seconds or $1.65 * V_{NDC}$ for 2 seconds, at $+25^{\circ}\text{C}$ |
| Test voltage between terminals and case | 3.2 kVac 50 Hz for 2 seconds                                                               |
| Damp Heat                               | IEC 60068-2-78                                                                             |
| Change of temperature                   | IEC 60068-2-14                                                                             |

## Operative Voltage Derating

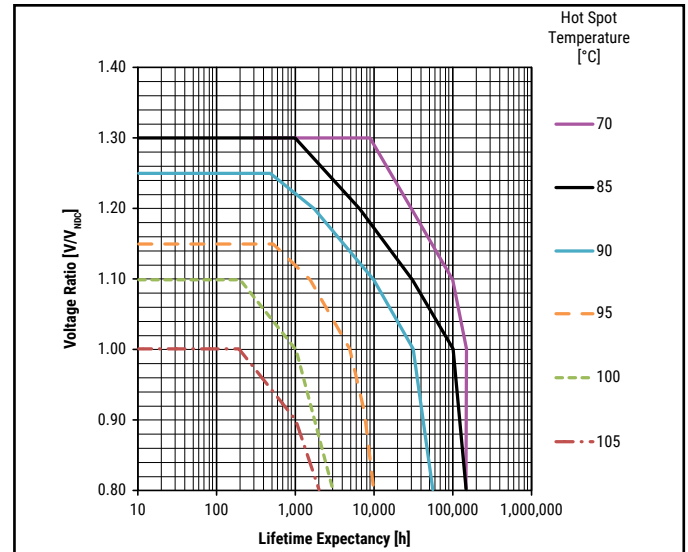
|                                                         | Voltage (VDC) |     |     |       |       | Life Expectancy (hrs) |
|---------------------------------------------------------|---------------|-----|-----|-------|-------|-----------------------|
| Operative Voltage at $70^{\circ}\text{C}$ ( $T_{HS}$ )  | 500           | 650 | 800 | 1,100 | 1,300 | 100,000               |
| Rated Voltage at $85^{\circ}\text{C}$ ( $T_{HS}$ )      | 450           | 600 | 700 | 900   | 1,100 | 100,000               |
| Operative Voltage at $105^{\circ}\text{C}$ ( $T_{HS}$ ) | 350           | 450 | 550 | 700   | 850   | 2,000                 |

## Lifetime Expectancy/Failure Quota Graphs

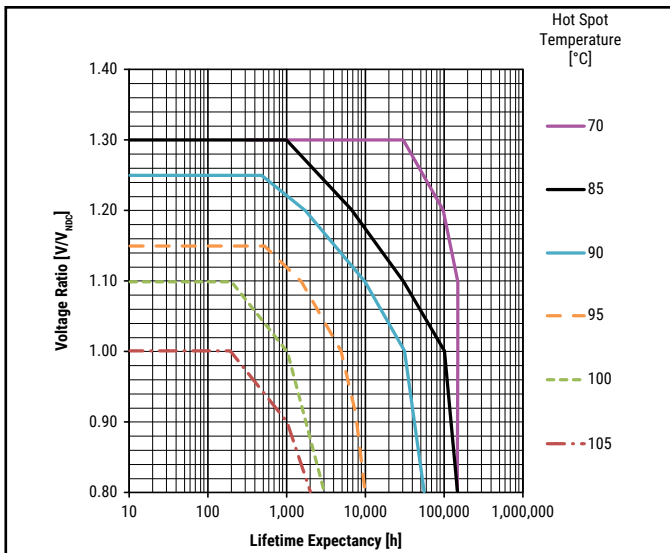
Lifetime Curve  $V_{NDC} = 450$  V-



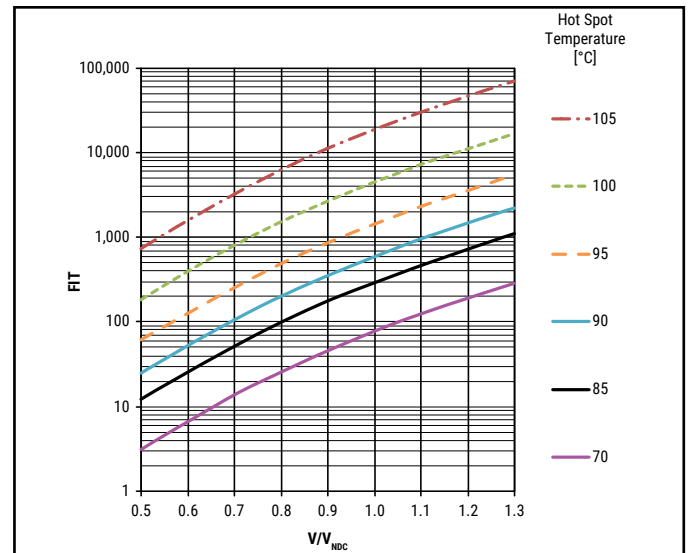
Lifetime Curve  $V_{NDC} = 600$  V- and  $V_{NDC} = 700$  V-



Lifetime Curve  $V_{NDC} = 900$  V- and  $V_{NDC} = 1,100$  V-



FIT at Hot Spot Temperatures



### Notes:

$$T_{HS} = T_{AMB} + \Delta T$$

$$\Delta T = ESR * I_{rms}^2 * R_{th}$$

$I_{rms}$  should be limited to values granting  $\Delta T \leq 30^\circ\text{C}$

## 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 RI2 losses and eventual failure can result.

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

| Cap Value<br>(μF) | VDC  | Dimensions (mm) |    |      |      |      | dV/dt<br>(V/μs) | Ipkr | ESL | ESR               | Irms*             | Rth      | PART NUMBER     |
|-------------------|------|-----------------|----|------|------|------|-----------------|------|-----|-------------------|-------------------|----------|-----------------|
|                   |      |                 |    |      |      |      |                 |      |     | 70°C at<br>10 kHz | 70°C at<br>10 kHz | (HS/Amb) |                 |
|                   |      | B               | H  | L    | P    | P1   |                 |      |     | mΩ                | Arms              | (°C/W)   |                 |
| 5.6               | 450  | 11              | 20 | 31.5 | 27.5 | \    | 10              | 54   | 25  | 13.1              | 4.5               | 44       | C4AEGBU4560A1WK |
| 10                | 450  | 13              | 25 | 31.5 | 27.5 | \    | 10              | 96   | 25  | 8.1               | 6.5               | 36       | C4AEGBU5100A1XK |
| 12.5              | 450  | 14              | 28 | 31.5 | 27.5 | \    | 10              | 122  | 26  | 6.8               | 7.5               | 33       | C4AEGBU5125A1YK |
| 15                | 450  | 19              | 29 | 31.5 | 27.5 | \    | 10              | 147  | 26  | 6                 | 8.5               | 29       | C4AEGBU5150A11K |
| 25                | 450  | 22              | 37 | 31.5 | 27.5 | \    | 10              | 245  | 28  | 4.5               | 11.5              | 23       | C4AEGBU5250A12K |
| 40                | 450  | 20              | 40 | 42   | 37.5 | 10.2 | 7               | 262  | 30  | 3.5               | 13.5              | 20       | C4AEGBW5400A3FK |
| 50                | 450  | 28              | 37 | 42   | 37.5 | 10.2 | 7               | 332  | 30  | 2.8               | 16                | 18       | C4AEGBW5500A3JK |
| 55                | 450  | 24              | 44 | 42   | 37.5 | 10.2 | 9               | 481  | 30  | 2.6               | 17                | 17       | C4AEGBW5550A3HK |
| 70                | 450  | 30              | 45 | 42   | 37.5 | 20.3 | 7               | 464  | 30  | 2.1               | 20.5              | 15       | C4AEGBW5700A3LK |
| 100               | 450  | 30              | 45 | 57.5 | 52.5 | 20.3 | 4               | 442  | 35  | 3                 | 19                | 12       | C4AEGBW6100A3MK |
| 130               | 450  | 35              | 50 | 57.5 | 52.5 | 20.3 | 4               | 581  | 35  | 2.4               | 23                | 10       | C4AEGBW6130A3NK |
| 3.3               | 600  | 11              | 20 | 31.5 | 27.5 | \    | 13              | 41   | 25  | 17                | 4                 | 44       | C4AEHBU4330A1WJ |
| 5.6               | 600  | 13              | 25 | 31.5 | 27.5 | \    | 13              | 71   | 25  | 10.7              | 6                 | 36       | C4AEHBU4560A1XJ |
| 7                 | 600  | 14              | 28 | 31.5 | 27.5 | \    | 13              | 88   | 26  | 9                 | 7                 | 33       | C4AEHBU4700A1YJ |
| 10                | 600  | 19              | 29 | 31.5 | 27.5 | \    | 13              | 127  | 26  | 6.8               | 8.5               | 29       | C4AEHBU5100A11J |
| 15                | 600  | 22              | 37 | 31.5 | 27.5 | \    | 13              | 190  | 28  | 5.3               | 10.5              | 23       | C4AEHBU5150A12J |
| 20                | 600  | 20              | 40 | 42   | 37.5 | 10.2 | 9               | 172  | 30  | 5.3               | 11                | 20       | C4AEHBU5200A3FJ |
| 30                | 600  | 28              | 37 | 42   | 37.5 | 10.2 | 9               | 255  | 30  | 3.6               | 14                | 18       | C4AEHBU5300A3JJ |
| 40                | 600  | 30              | 45 | 42   | 37.5 | 20.3 | 9               | 344  | 30  | 2.8               | 18                | 15       | C4AEHBU5400A3LJ |
| 55                | 600  | 30              | 45 | 57.5 | 52.5 | 20.3 | 6               | 319  | 35  | 4.1               | 16.5              | 12       | C4AEHBU5550A3MJ |
| 75                | 600  | 35              | 50 | 57.5 | 52.5 | 20.3 | 6               | 435  | 35  | 3.1               | 20.5              | 10       | C4AEHBU5750A3NJ |
| 2.7               | 700  | 11              | 20 | 31.5 | 27.5 | \    | 19              | 51   | 25  | 18.3              | 4                 | 44       | C4AEJBU4270A1WJ |
| 4                 | 700  | 13              | 25 | 31.5 | 27.5 | \    | 19              | 77   | 25  | 12.9              | 5.5               | 36       | C4AEJBU4400A1XJ |
| 5                 | 700  | 14              | 28 | 31.5 | 27.5 | \    | 19              | 96   | 26  | 10.7              | 6                 | 33       | C4AEJBU4500A1YJ |
| 8                 | 700  | 19              | 29 | 31.5 | 27.5 | \    | 19              | 154  | 26  | 7.3               | 8                 | 29       | C4AEJBU4800A11J |
| 12.5              | 700  | 22              | 37 | 31.5 | 27.5 | \    | 19              | 241  | 28  | 5.5               | 10                | 23       | C4AEJBU5125A12J |
| 15                | 700  | 20              | 40 | 42   | 37.5 | 5.1  | 13              | 196  | 30  | 6.2               | 10                | 20       | C4AEJBW5150A3FJ |
| 15                | 700  | 20              | 40 | 42   | 37.5 | 10.2 | 13              | 196  | 30  | 6.2               | 10                | 20       | C4AEJBW5150B3FJ |
| 20                | 700  | 28              | 37 | 42   | 37.5 | 10.2 | 13              | 262  | 30  | 4.7               | 12.5              | 18       | C4AEJBW5200A3JJ |
| 30                | 700  | 30              | 45 | 42   | 37.5 | 20.3 | 13              | 389  | 30  | 3.2               | 16.5              | 15       | C4AEJBW5300A3LJ |
| 45                | 700  | 30              | 45 | 57.5 | 52.5 | 20.3 | 9               | 389  | 35  | 4.4               | 16                | 12       | C4AEJBW5450A3MJ |
| 55                | 700  | 35              | 50 | 57.5 | 52.5 | 20.3 | 9               | 485  | 35  | 3.6               | 19                | 10       | C4AEJBW5550A3NJ |
| 60                | 700  | 35              | 50 | 57.5 | 52.5 | 20.3 | 9               | 530  | 35  | 3.4               | 19.5              | 10       | C4AEJBW5600A3NJ |
| 1.5               | 900  | 11              | 20 | 31.5 | 27.5 | \    | 24              | 36   | 25  | 26.3              | 3.5               | 44       | C4AEOBU4150A1WJ |
| 2.7               | 900  | 13              | 25 | 31.5 | 27.5 | \    | 24              | 65   | 25  | 15.3              | 5                 | 36       | C4AEOBU4270A1XJ |
| 3.3               | 900  | 14              | 28 | 31.5 | 27.5 | \    | 24              | 79   | 26  | 12.9              | 5.5               | 33       | C4AEOBU4330A1YJ |
| 5                 | 900  | 19              | 29 | 31.5 | 27.5 | \    | 24              | 120  | 26  | 9.1               | 7                 | 29       | C4AEOBU4500A11J |
| 8                 | 900  | 22              | 37 | 31.5 | 27.5 | \    | 24              | 193  | 28  | 6.6               | 9.5               | 23       | C4AEOBU4800A12J |
| 12                | 900  | 20              | 40 | 42   | 37.5 | 10.2 | 16              | 190  | 30  | 6.3               | 10                | 20       | C4AEOBW5120A3FJ |
| 14                | 900  | 28              | 37 | 42   | 37.5 | 10.2 | 16              | 229  | 30  | 5.4               | 11.5              | 18       | C4AEOBW5140A3JJ |
| 20                | 900  | 30              | 45 | 42   | 37.5 | 20.3 | 16              | 321  | 30  | 3.9               | 15                | 15       | C4AEOBW5200A3LJ |
| 30                | 900  | 30              | 45 | 57.5 | 52.5 | 20.3 | 11              | 324  | 35  | 5.2               | 15                | 12       | C4AEOBW5300A3MJ |
| 40                | 900  | 35              | 50 | 57.5 | 52.5 | 20.3 | 11              | 428  | 35  | 4                 | 18                | 10       | C4AEOBW5400A3NJ |
| 1                 | 1100 | 11              | 20 | 31.5 | 27.5 | \    | 28              | 28   | 25  | 33.1              | 3                 | 44       | C4AEQBU4100A1WJ |
| 1.8               | 1100 | 13              | 25 | 31.5 | 27.5 | \    | 29              | 52   | 25  | 19.1              | 4.5               | 36       | C4AEQBU4180A1XJ |
| 2.2               | 1100 | 14              | 28 | 31.5 | 27.5 | \    | 29              | 63   | 26  | 16                | 5                 | 33       | C4AEQBU4220A1YJ |
| 3.3               | 1100 | 19              | 29 | 31.5 | 27.5 | \    | 29              | 95   | 26  | 11.2              | 6.5               | 29       | C4AEQBU4330A11J |
| 5                 | 1100 | 22              | 37 | 31.5 | 27.5 | \    | 29              | 145  | 28  | 8.2               | 8.5               | 23       | C4AEQBU4500A12J |
| 8                 | 1100 | 20              | 40 | 42   | 37.5 | 10.2 | 20              | 157  | 30  | 7.9               | 9                 | 20       | C4AEQBW4800A3FJ |
| 10                | 1100 | 28              | 37 | 42   | 37.5 | 10.2 | 20              | 196  | 30  | 6.3               | 11                | 18       | C4AEQBW5100A3JJ |
| 12                | 1100 | 30              | 45 | 42   | 37.5 | 20.3 | 20              | 235  | 30  | 5.3               | 13                | 15       | C4AEQBW5120A3LJ |
| 20                | 1100 | 30              | 45 | 57.5 | 52.5 | 20.3 | 13              | 262  | 35  | 6.5               | 13                | 12       | C4AEQBW5200A3MJ |
| 25                | 1100 | 35              | 50 | 57.5 | 52.5 | 20.3 | 13              | 331  | 35  | 5.2               | 16                | 10       | C4AEQBW5250A3NJ |
| 27                | 1100 | 35              | 50 | 57.5 | 52.5 | 20.3 | 13              | 354  | 35  | 4.9               | 16.5              | 10       | C4AEQBW5270A3NJ |
| Cap Value<br>(μF) | VDC  | B               | H  | L    | P    | P1   | dV/dt<br>(V/μs) | Ipkr | ESL | ESR               | Irms              | Rth      | Part Number     |

(\*) Current value that leads to a ΔT of ~ 15°C in the Hot spot →  $T_{HS} = T_{AMB} + \Delta T = 70^\circ\text{C} + 15^\circ\text{C} = 85^\circ\text{C}$ 

For Packaging quantities not listed contact KEMET

## Soldering Process

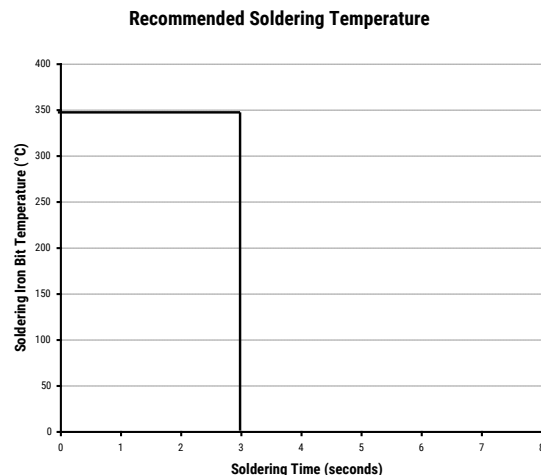
The implementation of the RoHS directive has resulted in the selection of SnAuCu (SAC) alloys, or SnCu alloys, as the primary solder material. This has increased the liquidus temperature from 183°C for a SnPb eutectic alloy to 217 – 221°C for new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 – 15 mm), and great care must be taken during soldering. The recommended solder profiles from KEMET should be used. Contact KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760-1 Edition 2 serves as a solid guideline for successful soldering. See Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the recommended limits may result in degradation or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after curing the surface mount parts. Contact KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Allow time for the capacitor surface temperature to return to normal before the second soldering cycle.

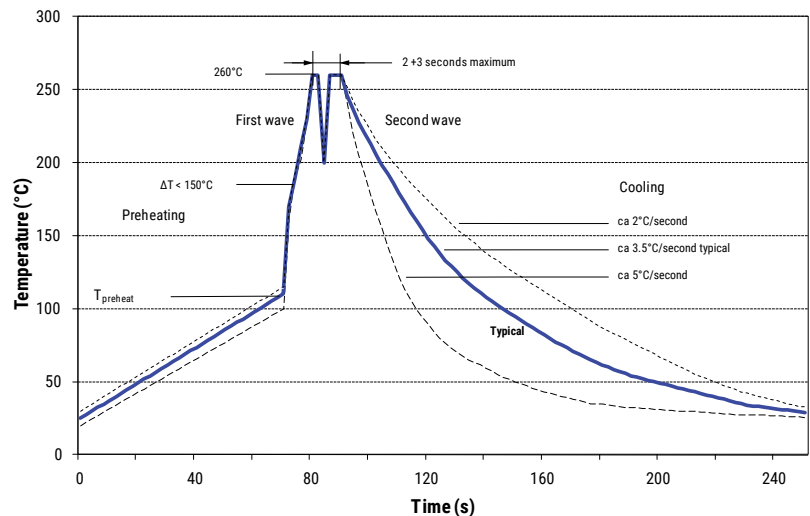
### Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C) maximum with the soldering duration not to exceed more than 3 seconds.

### Wave Soldering Recommendations



## Soldering Process cont'd

### Wave Soldering Recommendations cont'd

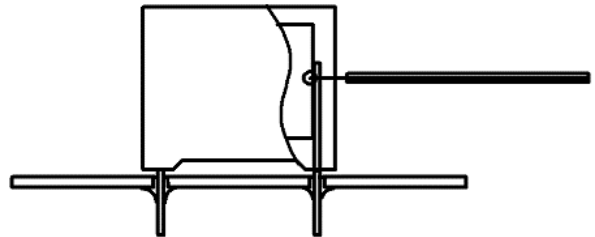
1. The tables indicates the maximum set-up temperature of the soldering process

| Dielectric Film Material | Maximum Preheat Temperature |                         |                         | Maximum Peak Soldering Temperature |                         |
|--------------------------|-----------------------------|-------------------------|-------------------------|------------------------------------|-------------------------|
|                          | Capacitor Pitch ≤ 10 mm     | Capacitor Pitch = 15 mm | Capacitor Pitch > 15 mm | Capacitor Pitch ≤ 15 mm            | Capacitor Pitch > 15 mm |
| Polyester                | 130°C                       | 130°C                   | 130°C                   | 270°C                              | 270°C                   |
| Polypropylene            | 100°C                       | 110°C                   | 130°C                   | 260°C                              | 270°C                   |
| Paper                    | 130°C                       | 130°C                   | 140°C                   | 270°C                              | 270°C                   |
| Polyphenylene Sulphide   | 150°C                       | 150°C                   | 160°C                   | 270°C                              | 270°C                   |

2. The maximum temperature measured inside the capacitor: set the temperature so that inside the element the maximum temperature is below the limit.

| Dielectric Film Material | Maximum Temperature Measured Inside the Element |
|--------------------------|-------------------------------------------------|
| Polyester                | 160°C                                           |
| Polypropylene            | 110°C                                           |
| Paper                    | 160°C                                           |
| Polyphenylene Sulphide   | 160°C                                           |

*Temperature monitored inside the capacitor.*

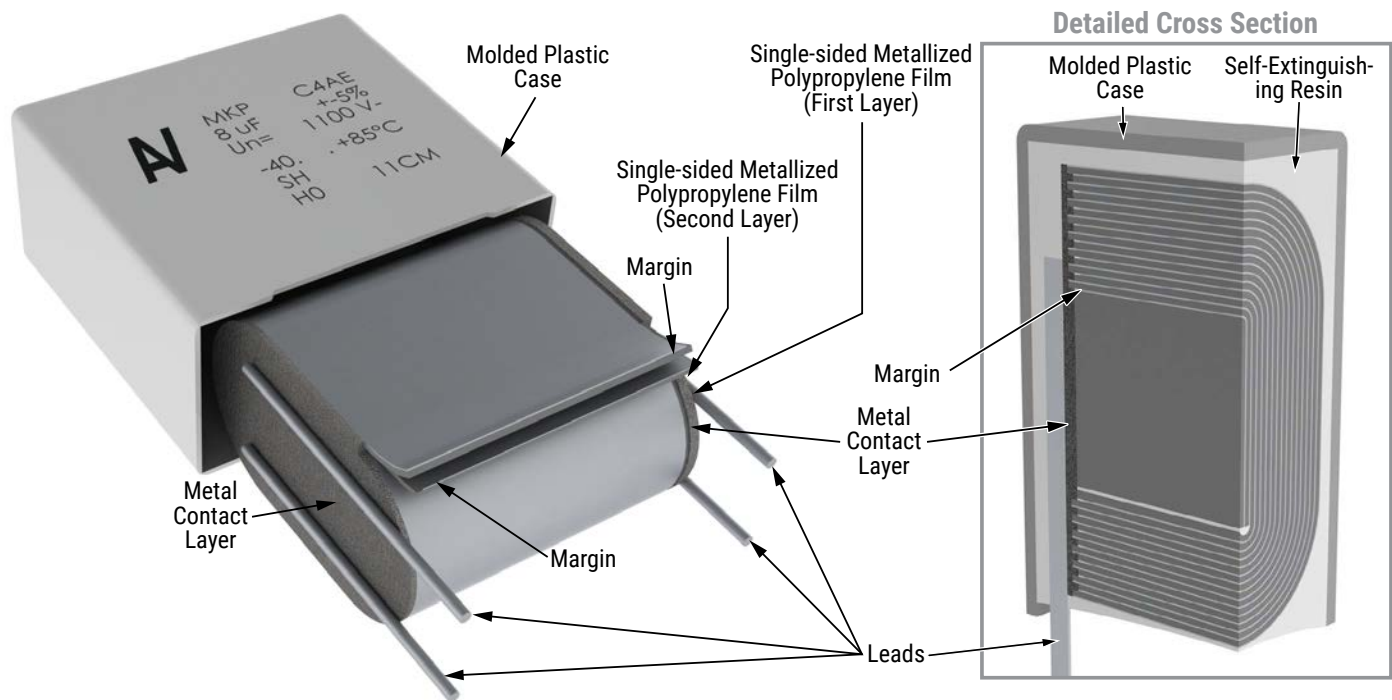


### Selective Soldering Recommendations

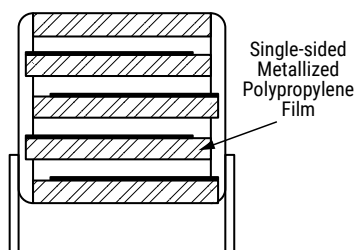
Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is pre-heated and transported over the solder bath, as in normal flow soldering, without touching the solder. When the board is over the bath, it is stopped. Pre-designed solder pots are lifted from the bath with molten solder, only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document. However, instead of two baths, there is only one with a time from 3 – 10 seconds. In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts do not overheat.

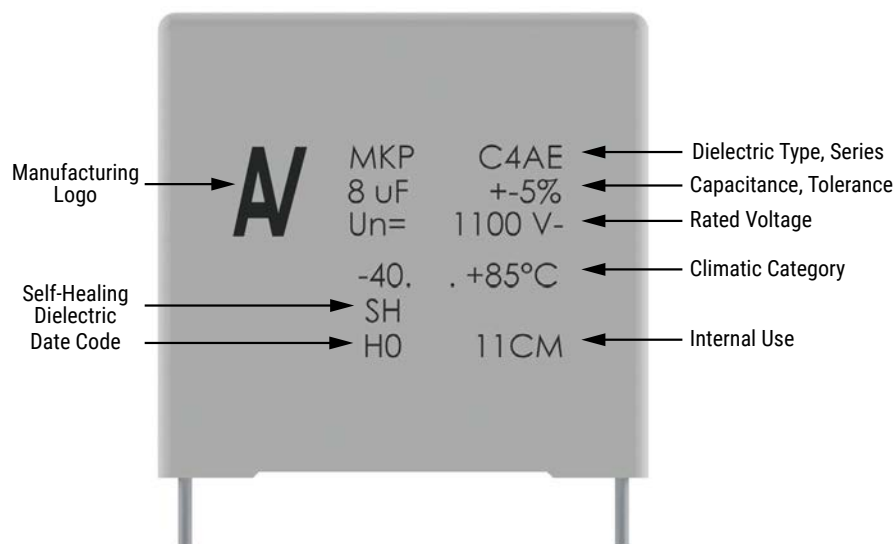
## Construction



## Winding Scheme



## Marking



| Manufacturing Date Code (IEC-60062) |      |           |      |
|-------------------------------------|------|-----------|------|
| Y = Year, Z = Month                 |      |           |      |
| Year                                | Code | Month     | Code |
| 2010                                | A    | January   | 1    |
| 2011                                | B    | February  | 2    |
| 2012                                | C    | March     | 3    |
| 2013                                | D    | April     | 4    |
| 2014                                | E    | May       | 5    |
| 2015                                | F    | June      | 6    |
| 2016                                | H    | July      | 7    |
| 2017                                | J    | August    | 8    |
| 2018                                | K    | September | 9    |
| 2019                                | L    | October   | 0    |
| 2020                                | M    | November  | N    |
| 2021                                | N    | December  | D    |
| 2022                                | P    |           |      |
| 2023                                | R    |           |      |
| 2024                                | S    |           |      |
| 2025                                | T    |           |      |
| 2026                                | U    |           |      |
| 2027                                | V    |           |      |
| 2028                                | W    |           |      |
| 2029                                | X    |           |      |
| 2030                                | A    |           |      |

## 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).

---

## Disclaimer

All product specifications, statements, information and data (collectively, the "Information") in this datasheet are subject to change. The customer is responsible for checking and verifying the extent to which the Information contained in this publication is applicable to an order at the time the order is placed. All Information given herein is believed to be accurate and reliable, but it is presented without guarantee, warranty, or responsibility of any kind, expressed or implied.

Statements of suitability for certain applications are based on KEMET Electronics Corporation's ("KEMET") knowledge of typical operating conditions for such applications, but are not intended to constitute – and KEMET specifically disclaims – any warranty concerning suitability for a specific customer application or use. The Information is intended for use only by customers who have the requisite experience and capability to determine the correct products for their application. Any technical advice inferred from this Information or otherwise provided by KEMET with reference to the use of KEMET's products is given gratis, and KEMET assumes no obligation or liability for the advice given or results obtained.

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.

*KEMET is a registered trademark of KEMET Electronics Corporation.*