

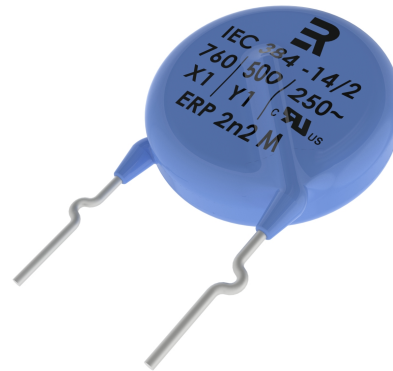
## Safety Standard Recognized, ERP610 Series, Encapsulated, X1 760 VAC/Y1 500 VAC (Industrial Grade)

### Overview

KEMET's ERO610 series encapsulated radial leaded ceramic disc capacitors are specifically designed for interference-suppression AC line filtering applications. Having internationally recognized safety certifications, these capacitors are well-suited for applications that require keeping potentially disruptive or damaging line transients and EMI out of susceptible equipment. They are also an ideal solution when needing to suppress line disturbances at the source.

Safety Certified Capacitors are classified as either X and/or Y capacitors. Class X capacitors are primarily used in line-to-line (across-the-line) applications. In this application there is no danger of electric shock to humans should the capacitor fail, but could result in a risk of fire. The class Y capacitor is primarily used in line-to-ground (line by-pass) applications. In this application, failure of the capacitor could lead to danger of electric shock.

With a working voltage of 760 VAC in line-to-line (Class X) and 500 VAC in line-to-ground (Class Y) applications, these safety capacitors meet the impulse test criteria outlined in IEC Standard 60384. Meeting subclass X1 and Y1 requirements, these devices are certified to withstand impulses up to 4 KV (X1) and 8 KV (Y1) respectively. These encapsulated devices also meet the flame test requirements outlined in UL Standard 94V-0.



### Ordering Information

| ERP610         | W  | 102   | M                                | DF0                                 |
|----------------|--|---|----------------------------------|-------------------------------------|
| Ceramic Series | Voltage Rating<br>(Safety Subclass Rating) | Capacitance Code (pF)                       | Capacitance Tolerance            | Lead configuration / Packaging Code |
| ERP610         | W = X1 760 VAC/Y1 500 VAC                  | Two significant digits and Number of zeroes | K = $\pm 10\%$<br>M = $\pm 20\%$ | *See Packaging Options              |

## Packaging C-Spec Ordering Options Tables

| Bulk Packaging <sup>1</sup>   |                         |                 |                |         |
|-------------------------------|-------------------------|-----------------|----------------|---------|
|                               | LEAD LENGTH L           | LEAD DIAMETER D | LEAD SPACING F |         |
|                               |                         |                 | 10 mm          | 12.5 mm |
| Straight leads                | 30 mm - 3 mm            | 0.6 mm          | DF0            | EF0     |
|                               |                         | 0.8 mm          | DJ0            | EJ0     |
|                               | 10 mm ± 1 mm            | 0.6 mm          | DD0            | ED0     |
|                               |                         | 0.8 mm          | DH0            | EH0     |
|                               | 6 mm - 1 mm             | 0.6 mm/0.8 mm   | DB0            | EB0     |
| Preformed leads inside crimp  | 30 mm - 3 mm            | 0.6 mm          |                | EFG     |
|                               |                         | 0.8 mm          |                | EJG     |
| Preformed leads outside crimp | 5 mm ± 1 mm             | 0.6 mm          | TE0            | TG0     |
|                               |                         | 0.8 mm          | TF0            | TH0     |
| Preformed leads snap-in       | Minimum 2.8 mm          | 0.6 mm          |                | QG0     |
|                               | Minimum 3.5 mm          | 0.8 mm          |                | QH0     |
| Inline wire                   | Minimum 2.8 mm + 1.5 mm | 0.6 mm          | YE0            | YG0     |
|                               | Minimum 3.0 mm + 2.0 mm | 0.8 mm          | YF0            | YH0     |

<sup>1</sup> 5 mm and 7 mm lead spacing options are not available for ERP610 Series.

| Reel Packaging Component Pitch 25.4 mm <sup>1</sup> |              |               |         |
|---|--------------|---------------|---------|
|   |              | TAPING F      |         |
|   |              | 10 mm         | 12.5 mm |
| Lead spacing F                                      |              |               |         |
| Body diameter D                                     |              | All diameters |         |
| Straight leads                                      | H = 16.5 mm  | DRT           | ERT     |
|   | H = 18.0 mm  | DRU           | ERU     |
|   | H = 20.0 mm  | DRY           | ERY     |
| Preformed leads inside crimp                        | H0 = 16.0 mm | –             | ERZ     |
| Preformed leads outside crimp                       | H0 = 16.0 mm | TDR           | TER     |
| Inline wire   | H0 = 16.0 mm | YRD           | YRE     |

<sup>1</sup> 5 mm and 7 mm lead spacing options are not available for ERP610 Series.

## Benefits

- Safety Standard Recognized (IEC 60384-14)
- Reliable operation up to 125°C
- Class X1/Y1
- 10 mm and 12.5 mm lead spacing
- RoHS compliant
- Capacitance offerings ranging from 33 pF up to 4.7 nF
- Available capacitance tolerances of  $\pm 10\%$  and  $\pm 20\%$
- High reliability
- Preformed (crimped) or straight lead configurations
- Non-polar device, minimizing installation concerns
- Encapsulation meets flammability standard UL 94V-0

## Applications

Typical applications include line-to-Line (Class X) filtering, line to-ground (Class Y) filtering, antenna coupling, primary and secondary coupling (switching power supplies) and line disturbances suppression (motors and motor controls, relays, switching power supplies and invertors).

## Approval Standard and Certification Number

| Safety Standard | Specification                | Certificate Number |
|-----------------|------------------------------|--------------------|
| VDE             | EN 132400                    | 40001993, 40001996 |
| UL<br>CAN/CSA   | UL 60384-14 and<br>E60384-14 | E356389            |

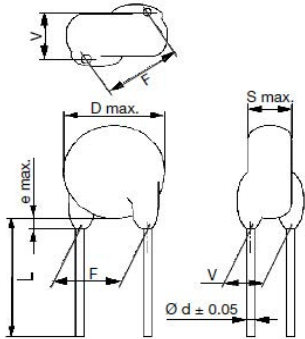
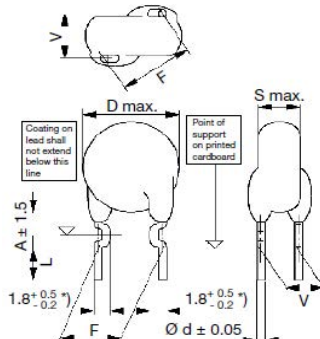
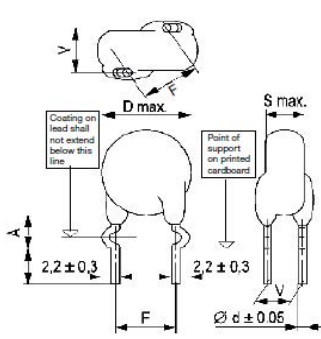
*These devices are VDE/ENEC recognized for antenna coupling and AC line-to-line (Class X) and line-to-ground (Class Y) applications per IEC60384-14.*

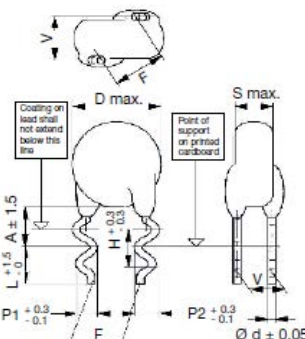
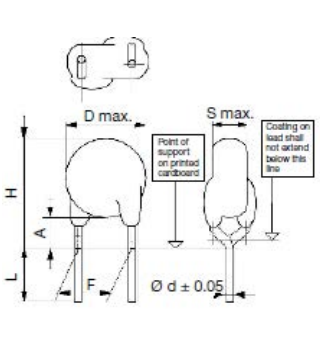
## Environmental Compliance

These devices are RoHS Compliant. They meet all requirements set forth by both EU and China RoHS directives.



## Lead Configurations

| Straight Leads  |                        | Inside Kink   |  | Outside Kink  |                                   |
|---|------------------------|---|--|---|-----------------------------------|
|  |                        |  |  |  |                                   |
| Φd  | 0.6 or 0.8             | Φd  | 0.6 or 0.8                                   | Φd  | 0.6                               |
| L   | 30 - 3 or 10 ± 1       | F   | 7.5    10    12.5                            | F   | 5.0    7.5    7.5    10.0    12.5 |
| F   | 5    7.5    10    12.5 | A   | 4.0 ± 1.5    5.0 ± 1.5    6.0 ± 1.5          | A   | 5.0    5.0    6.0    6.0    6.0   |
| e   | 3.0 mm Maximum         | L   | 3.0 mm Minimum<br>Tolerance: 1.0 mm absolute |   |                                   |

| Snap-In Leads   |                                      | Vertical Crimp  |  |
|---|--------------------------------------|---|--|
|  |                                      |  |  |
| Φd  | 0.6    0.8                           | F   | 7.5    10    12.5                            |
| F   | 7.5 / 10 / 12.5    7.5 / 10 / 12.5   | D   | 0.6    0.8    0.8                            |
| L   | 2.8 mm Minimum    3.5 mm Minimum     | A   | 4.5 Maximum    6.0 Maximum    6.0 Maximum    |
| H   | 2.6    3.3                           | L   | 2.8 Minimum    3.0 Minimum    3.0 Minimum    |
| P1  | 1.25    1.65                         |   | 1.5 absolute    2.0 absolute    2.0 absolute |
| P2  | 1.65    1.95                         |   |  |
| A   | D - 8: 6.0 ± 1.5    D > 8: 7.0 ± 1.5 |   |  |

## General Specifications/Performance Characteristics

| Dielectric/Temperature Characteristic                               | U2J  | Y5S   | Y5T       | Y5U      |
|---|--|-------|-----------|----------|
| Operating Temperature Range:  | -40°C to +125°C  |       |           |          |
| Capacitance Change with Reference to +25°C and 0 VDC Applied (TCC): | -750 ±120 ppm/°C   | ±22%  | +22%/-33% | 22%/-56% |
| Test Voltage Between Terminals                                      | Component test:<br>4,000 VAC, 50 Hz, 2 seconds<br>As repeated test admissible only once with<br>4,000 VAC, 50 Hz, 60 seconds<br>Random sampling test (destructive test):<br>4,000 VAC, 50 Hz, 60 seconds |       |           |          |
| Dielectric Strength of Body Insulation                              | 4,000 VAC, 50 Hz,60 seconds (destructive test)   |       |           |          |
| <sup>1</sup> Dissipation Factor (tanδ) at +25°C <sup>1</sup>        | 0.50%  | 2.50% |           |          |
| Insulation Resistance (IR) Limit at +25°C                           | 10,000 MΩ Minimum<br>(500 VDC applied for 60±5 seconds at 25°C)  |       |           |          |

\*C = Nominal capacitance

<sup>1</sup> Capacitance and Dissipation Factor (DF) measured under the following conditions:

U2J: 1 MHz ± 100 kHz and 1.0 ±0.2 Vrms

Y5S, Y5T and Y5U: 1 kHz ± 50 Hz and 1.0 ±0.2 Vrms

Note: When measuring capacitance, it is important to ensure the set voltage level is held constant. The HP4284 & Agilent E4980 have a feature known as Automatic Level Control (ALC). The ALC feature should be switched to "ON."

## Table 1 – Product Ordering Codes and Ratings

| Dielectric/<br>Temp.<br>Char. | KEMET<br>Part Number | Capacitance | Capacitance<br>Tolerance | Dimensions (mm)               |                                |                  | Lead Spacing      |                   |
|-------------------------------|----------------------|-------------|--------------------------|-------------------------------|--------------------------------|------------------|-------------------|-------------------|
|                               |                      |             |                          | Body<br>Diameter<br>(Maximum) | Body<br>Thickness<br>(Maximum) | Lead<br>Diameter | Bulk<br>Packaging | Ammo<br>Packaging |
| U2J                           | ERP610W330           | 33 pF       | ±10%<br>±20%             | 8.0                           | 6.0                            | 0.6<br>0.8       | 10<br>12.5        |                   |
| Y5S                           | ERP610W470           | 47 pF       |                          |                               |                                |                  |                   |                   |
|                               | ERP610W680           | 68 pF       |                          |                               |                                |                  |                   |                   |
| Y5T                           | ERP610W101           | 100 pF      |                          |                               |                                |                  |                   |                   |
|                               | ERP610W151           | 150 pF      |                          |                               |                                |                  |                   |                   |
| Y5U                           | ERP610W221           | 220 pF      |                          |                               |                                |                  |                   |                   |
|                               | ERP610W331           | 330 pF      |                          |                               |                                |                  |                   |                   |
|                               | ERP610W471           | 470 pF      |                          |                               |                                |                  |                   |                   |
|                               | ERP610W681           | 680 pF      |                          |                               |                                |                  |                   |                   |
|                               | ERP610W102           | 1000 pF     |                          |                               |                                |                  |                   |                   |
|                               | ERP610W152           | 1500 pF     |                          |                               |                                |                  |                   |                   |
|                               | ERP610W222           | 2200 pF     |                          |                               |                                |                  |                   |                   |
|                               | ERP610W272           | 2700 pF     |                          |                               |                                |                  |                   |                   |
|                               | ERP610W332           | 3300 pF     |                          |                               |                                |                  |                   |                   |
|                               | ERP610W392           | 3900 pF     |                          |                               |                                |                  |                   |                   |
|                               | ERP610W472           | 4700 pF     |                          |                               |                                |                  |                   |                   |
|                               | KEMET<br>Part Number | Capacitance | Capacitance<br>Tolerance | Body Diameter<br>(Maximum)    | Body Thickness<br>(Maximum)    | Lead Diameter    | Lead Spacing      |                   |

(1) To properly complete ordering code, enter the three-digit alphanumeric "Packaging Code." See "Dimensions" section of this document, page 2, for available options.



## Soldering and Mounting Information

| Soldering Specifications     |                               |                              |
|------------------------------|-------------------------------|------------------------------|
|                              | Solderability                 | Resistance to Soldering Heat |
| Soldering Temperature        | 235°C ± 5°C                   | 260°C ± 5°C                  |
| Solder Duration              | 2 seconds ± 0.5 seconds       | 10 seconds ± 1.0 seconds     |
| Distance from component body | ≥ 2 mm                        | ≥ 5 mm                       |
| CSA (cUL recognition)        | C 22.2 No. 1-M90 (Ur=250 VAC) | 216038                       |

Soldering test for capacitors with wire leads: (according to IEC 60068-2-20, solder bath method)

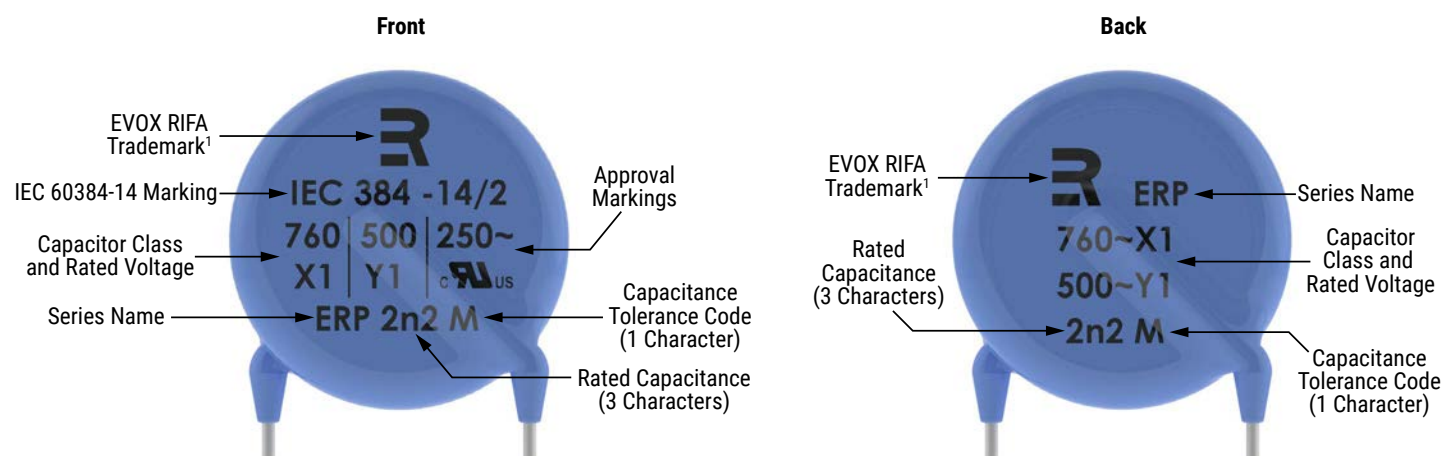
### Soldering Recommendations

When soldering this product to a PCB/PWB, do not exceed the solder heat resistance specification of the capacitor. Subjecting this product to excessive heating could reflow the solder joint between the lead and ceramic element and/or may result in thermal shocks that can crack the ceramic element.

### Cleaning Recommendations

The components should be cleaned immediately following the soldering operation with vapor degreasers.

## Marking



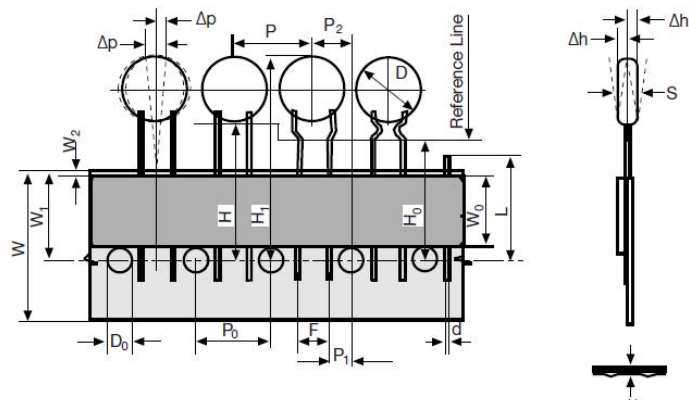
<sup>1</sup> EVOX RIFA and all associated products were acquired by KEMET in 2007. The EVOX RIFA trademark is still used on the capacitor marking.

## Figure 1 - Ammo Pack Taping Format

### TAPING P/T/U

COMPONENT PITCH 0.5 inch

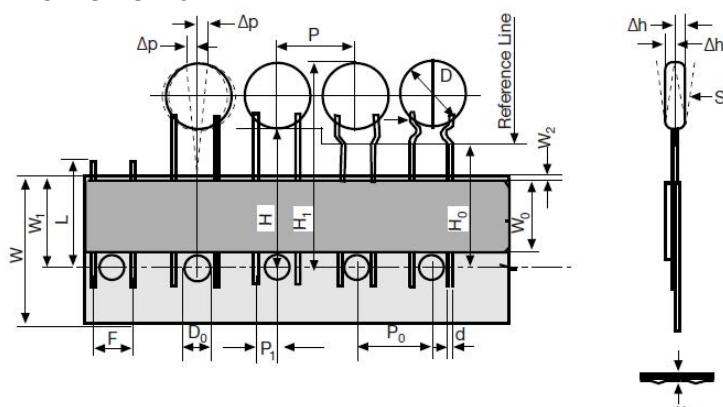
LEAD SPACING 5.0 mm



### TAPING P/T/U

COMPONENT PITCH 0.5 inch

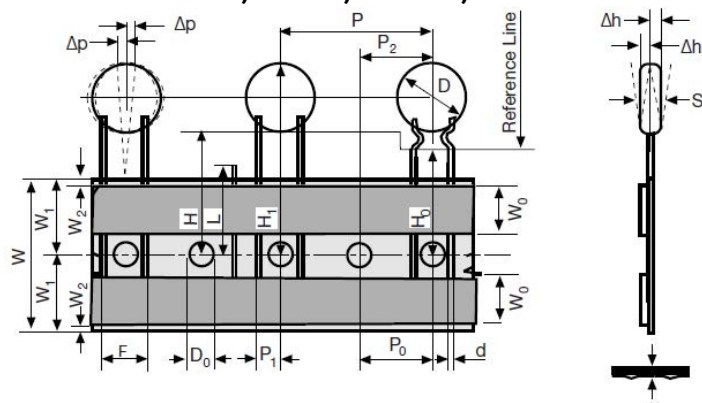
LEAD SPACING 7.5 mm



### TAPING F

COMPONENT PITCH 1.0 inch

LEAD SPACING 5.0 mm, 7.5 mm, 10.0 mm, and 12.5 mm





**Table 3 – Ammo Pack Taping Specifications**

| Lead Style  |        | TAPING P         | TAPING T  | TAPING U | TAPING F                        |
|---|--------|------------------|-----------|----------|---------------------------------|
| Item  | Symbol | Dimensions(mm)   |           |          |                                 |
| Pitch of component  | P      | 12.7±1           |           |          | 25.4±1                          |
| Pitch of sprocket hole  | P0     | 12.7±0.3         |           |          | 12.7±0.3                        |
| Distance, hole to lead  | P1     | 3.85±0.7         |           |          | (0.5F) ±0.7                     |
| Distance, hole to center of component   | P2     | 6.35±1.3         |           |          | 12.7±1.3                        |
| Lead spacing  | F      | 5.0/7.5+0.8/-0.2 |           |          | 5/7.5/10/12.5±0.8               |
| Average deviation across tape   | Δh     | ±2.0 Maximum     |           |          | ±3.0 Maximum                    |
| Average deviation in direction of reeling   | Δp     | ±1.3 Maximum     |           |          | ±1.3 Maximum                    |
| Carrier tape width  | W      | 18.0+1/-0.5      |           |          | 18.0+1/-0.5                     |
| Hold-down tape width  | W0     | 6                |           |          | 6                               |
| Position of sprocket hole   | W1     | 9.0+0.75/-0.5    |           |          | 9.0+0.75/-0.5                   |
| Distance of hold-down tape  | W2     | 3.0 Maximum      |           |          | 3.0 Maximum                     |
| Distance between the abscissa and the bottom place of the component body (straight leads) | H      | 16.5±0.5         | 18.0+2/-0 | 20±1     | 16.5±0.5<br>18.0+2/-0<br>20.0±1 |
| Distance between the abscissa and the bottom place of the component body (kinked leads)   | H0     | 16.0±0.5         |           |          | 16.0±0.5                        |
| Length of cut leads   | L      | 11.0 Maximum     |           |          | 11.0 Maximum                    |
| Diameter of sprocket hole   | D0     | 4.0±0.2          |           |          | 4.0±0.2                         |
| Total tape thickness  | t      | 0.9 Maximum      |           |          | 0.9 Maximum                     |

<sup>1</sup> Prefromed (crimped) lead configurations include vertical kink, outside kink and inside kink. See "Lead Configurations" and "Ordering Information" sections of this document for further details.

<sup>2</sup> Also referred to as "lead length" in this document.

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