

# PME271Y, Metallized Impregnated Paper, Class Y2, 250 VAC

## Overview

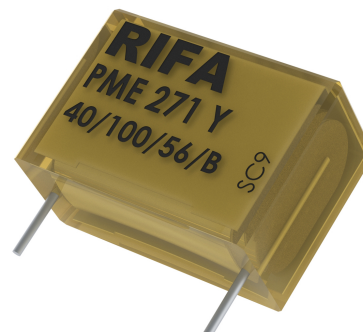
Multilayer, metallized paper, encapsulated and impregnated in self-extinguishing material that meets the requirements of UL 94 V-0.

## Applications

For worldwide use as an electromagnetic interference suppressor in all Y2 applications, line-to-earth.

## Benefits

- Approvals: ENEC, UL, cUL, CQC
- Rated voltage: 250 VAC 50/60 Hz
- Capacitance range: 0.001 – 0.1  $\mu$ F
- Lead spacing: 10.2 – 25.4 mm
- Capacitance tolerance:  $\pm 20\%$
- Climatic category: 40/100/56/B, IEC 60068-1
- Tape & Reel packaging in accordance with IEC 60286-2
- RoHS compliance and lead-free terminations
- Operating temperature range of  $-40^{\circ}\text{C}$  to  $+100^{\circ}\text{C}$
- 100% screening factory test at 3,000 VDC
- Highest possible safety regarding active and passive flammability



## Customer Part Number System

| PME271               | Y                   | 410                                                                                                      | M                     | R30                        |
|----------------------|---------------------|----------------------------------------------------------------------------------------------------------|-----------------------|----------------------------|
| Series               | Rated Voltage (VAC) | Capacitance Code (pF)                                                                                    | Capacitance Tolerance | Packaging                  |
| Y2, Metallized Paper | Y = 250             | The last two digits represent significant figures. The first digit specifies the total number of digits. | M = $\pm 20\%$        | See Ordering Options Table |

## KEMET Internal Part Number System

| P               | 271                  | H                                            | E                   | 102                                                                                    | M                     | 250                 | A                          |
|-----------------|----------------------|----------------------------------------------|---------------------|----------------------------------------------------------------------------------------|-----------------------|---------------------|----------------------------|
| Capacitor Class | Series               | Lead Spacing (mm)                            | Size Code           | Capacitance Code (pF)                                                                  | Capacitance Tolerance | Rated Voltage (VAC) | Lead and Packaging Code    |
| P = Paper       | Y2, Metallized Paper | H = 10.2<br>Q = 15.2<br>C = 20.3<br>E = 25.4 | See Dimension Table | First two digits represent significant figures. Third digit specifies number of zeros. | M = $\pm 20\%$        | 250 = 250           | See Ordering Options Table |

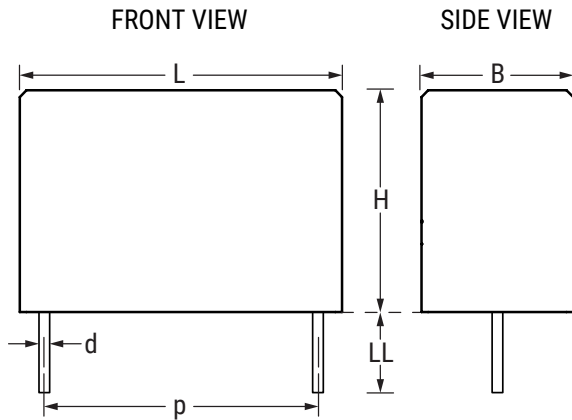
## Benefits cont.

- Excellent self-healing properties ensure long life, even when subjected to frequent overvoltages
- Good resistance to ionization due to impregnated dielectric
- High dv/dt capability
- Impregnated paper that ensures excellent stability and reliability, particularly in applications with continuous operation

## Ordering Options Table

| Lead Spacing Nominal (mm)        | Type of Leads and Packaging                | Lead Length (mm)           | KEMET Lead and Packaging Code | Legacy Lead and Packaging Code |
|----------------------------------|--------------------------------------------|----------------------------|-------------------------------|--------------------------------|
| 10.2                             | <b>Standard Lead and Packaging Options</b> |                            |                               |                                |
|                                  | Bulk (Bag) – Short Leads                   | 6 +0/-1                    | C                             | R06                            |
|                                  | Bulk (Bag) – Maximum Length Leads          | 30 +5/-0                   | A                             | R30                            |
|                                  | Tape & Reel (Standard Reel)                | H <sub>0</sub> = 18.5 ±0.5 | L                             | R19T0                          |
|                                  | <b>Other Lead and Packaging Options</b>    |                            |                               |                                |
|                                  | Tape & Reel (Large Reel)                   | H <sub>0</sub> = 18.5 ±0.5 | P                             | R19T1                          |
| <b>Native 10.2 formed to 7.5</b> | Ammo Pack                                  | H <sub>0</sub> = 18.5 ±0.5 | LAF3                          | R30XA                          |
| 15.2                             | <b>Standard Lead and Packaging Options</b> |                            |                               |                                |
|                                  | Bulk (Bag) – Short Leads                   | 6 +0/-1                    | C                             | R06                            |
|                                  | Bulk (Bag) – Maximum Length Leads          | 30 +5/-0                   | A                             | R30                            |
|                                  | Tape & Reel (Standard Reel)                | H <sub>0</sub> = 18.5 ±0.5 | L                             | R19T0                          |
|                                  | <b>Other Lead and Packaging Options</b>    |                            |                               |                                |
|                                  | Tape & Reel (Large Reel)                   | H <sub>0</sub> = 18.5 ±0.5 | P                             | R19T1                          |
| 20.3                             | <b>Standard Lead and Packaging Options</b> |                            |                               |                                |
|                                  | Bulk (Bag) – Short Leads                   | 6 +0/-1                    | C                             | R06                            |
|                                  | Bulk (Bag) – Maximum Length Leads          | 30 +5/-0                   | A                             | R30                            |
|                                  | Tape & Reel (Standard Reel)                | H <sub>0</sub> = 18.5 ±0.5 | L                             | R19T0                          |
|                                  | <b>Other Lead and Packaging Options</b>    |                            |                               |                                |
|                                  | Tape & Reel (Large Reel)                   | H <sub>0</sub> = 18.5 ±0.5 | P                             | R19T1                          |
| 25.4                             | <b>Standard Lead and Packaging Options</b> |                            |                               |                                |
|                                  | Bulk (Bag) – Short Leads                   | 6 +0/-1                    | C                             | R06                            |
|                                  | Bulk (Bag) – Maximum Length Leads          | 30 +5/-0                   | A                             | R30                            |

## Dimensions – Millimeters



| <b>p</b>                                                                  |           | <b>B</b> |           | <b>H</b> |           | <b>L</b> |           | <b>d</b> |           |
|---------------------------------------------------------------------------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|
| Nominal                                                                   | Tolerance | Nominal  | Tolerance | Nominal  | Tolerance | Nominal  | Tolerance | Nominal  | Tolerance |
| 10.2                                                                      | ±0.4      | 3.9      | Maximum   | 7.5      | Maximum   | 13.5     | Maximum   | 0.6      | ±0.05     |
| 10.2                                                                      | ±0.4      | 4.1      | Maximum   | 8.2      | Maximum   | 13.5     | Maximum   | 0.6      | ±0.05     |
| 10.2                                                                      | ±0.4      | 5.1      | Maximum   | 10.5     | Maximum   | 13.5     | Maximum   | 0.6      | ±0.05     |
| 15.2                                                                      | ±0.4      | 5.2      | Maximum   | 10.5     | Maximum   | 18.5     | Maximum   | 0.8      | ±0.05     |
| 15.2                                                                      | ±0.4      | 5.5      | Maximum   | 11.0     | Maximum   | 18.5     | Maximum   | 0.8      | ±0.05     |
| 15.2                                                                      | ±0.4      | 7.3      | Maximum   | 13.0     | Maximum   | 18.5     | Maximum   | 0.8      | ±0.05     |
| 20.3                                                                      | ±0.4      | 7.6      | Maximum   | 14.0     | Maximum   | 24.0     | Maximum   | 0.8      | ±0.05     |
| 20.3                                                                      | ±0.4      | 9.0      | Maximum   | 15.0     | Maximum   | 24.0     | Maximum   | 0.8      | ±0.05     |
| 20.3                                                                      | ±0.4      | 11.3     | Maximum   | 16.5     | Maximum   | 24.0     | Maximum   | 0.8      | ±0.05     |
| 25.4                                                                      | ±0.4      | 12.1     | Maximum   | 19.0     | Maximum   | 30.5     | Maximum   | 1.0      | ±0.05     |
| <b>Note: See the Ordering Options Table for lead length (LL) options.</b> |           |          |           |          |           |          |           |          |           |

## Performance Characteristics

|                                |                                                                                                                                                                                                                                                                                                                                                              |      |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| Rated Voltage                  | 250 VAC 50/60 Hz                                                                                                                                                                                                                                                                                                                                             |      |
| Capacitance Range              | 0.001 – 0.1 $\mu$ F                                                                                                                                                                                                                                                                                                                                          |      |
| Capacitance Tolerance          | $\pm$ 20%                                                                                                                                                                                                                                                                                                                                                    |      |
| Temperature Range              | –40°C to +100°C                                                                                                                                                                                                                                                                                                                                              |      |
| Climatic Category              | 40/100/56/B                                                                                                                                                                                                                                                                                                                                                  |      |
| Approvals                      | ENEC, UL, CSA, CQC                                                                                                                                                                                                                                                                                                                                           |      |
| Dissipation Factor             | Maximum Values at +23°C                                                                                                                                                                                                                                                                                                                                      |      |
|                                | 1 kHz                                                                                                                                                                                                                                                                                                                                                        | 1.3% |
| Test Voltage Between Terminals | The 100% screening factory test is carried out at 3,000 VDC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. This test may not be repeated due to potential capacitor damage. KEMET is not liable for any failures that result from repeating the test. |      |
| Insulation Resistance          | Minimum Value Between Terminals                                                                                                                                                                                                                                                                                                                              |      |
|                                | 12,000 M $\Omega$                                                                                                                                                                                                                                                                                                                                            |      |
| In DC Applications             | Recommended voltage $\leq$ 1,000 VDC                                                                                                                                                                                                                                                                                                                         |      |

## Environmental Test Data

| Test                 | IEC Publication        | Procedure                                                                  |
|----------------------|------------------------|----------------------------------------------------------------------------|
| Vibration            | IEC 60068–2–6 Test Fc  | 3 directions at 2 hours each 10 – 500 Hz at 0.75 mm or 98 m/s <sup>2</sup> |
| Bump                 | IEC 60068–2–29 Test Eb | 4,000 bumps at 390 m/s <sup>2</sup>                                        |
| Solderability        | IEC 60068–2–20 Test Ta | Solder globule method                                                      |
| Active flammability  | IEC 60384–14           |                                                                            |
| Passive flammability | IEC 60384–14           | Needle-flame test                                                          |
| Humidity             | IEC 60068–2–3 Test Ca  | +40°C and 90 – 95% R.H.                                                    |

## Approvals

| Mark                                                                              | Specification                       | File Number |
|-----------------------------------------------------------------------------------|-------------------------------------|-------------|
|  | EN/IEC 60384-14                     | SE/0140-27D |
|  | UL 60384-14<br>CAN/CSA-E60384-14-09 | E73869      |
|  | CQC                                 | 14001107140 |

## Environmental Compliance

All KEMET EMI capacitors are RoHS compliant.



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

| Capacitance Value (μF) | Maximum Dimensions in mm |        |        | Lead Spacing (p) | f <sub>o</sub> (MHz) | dV/dt (V/μs) | KEMET Internal Part Number | Customer Part Number |
|------------------------|--------------------------|--------|--------|------------------|----------------------|--------------|----------------------------|----------------------|
|                        | B                        | H      | L      |                  |                      |              |                            |                      |
| 0.0010                 | 3.9                      | 7.5    | 13.5   | 10.2             | 53                   | 2,000        | P271HE102M250(1)           | PME271Y410M(1)       |
| 0.0015                 | 3.9                      | 7.5    | 13.5   | 10.2             | 44                   | 2,000        | P271HE152M250(1)           | PME271Y415M(1)       |
| 0.0022                 | 3.9                      | 7.5    | 13.5   | 10.2             | 37                   | 2,000        | P271HE222M250(1)           | PME271Y422M(1)       |
| 0.0033                 | 4.1                      | 8.2    | 13.5   | 10.2             | 30                   | 2,000        | P271HH332M250(1)           | PME271Y433M(1)       |
| 0.0047                 | 5.1                      | 10.5   | 13.5   | 10.2             | 24                   | 2,000        | P271HL472M250(1)           | PME271Y447M(1)       |
| 0.0068                 | 5.2                      | 10.5   | 18.5   | 15.2             | 19                   | 1,400        | P271QE682M250(1)           | PME271Y468M(1)       |
| 0.0100                 | 5.2                      | 10.5   | 18.5   | 15.2             | 16                   | 1,400        | P271QE103M250(1)           | PME271Y510M(1)       |
| 0.0150                 | 5.5                      | 11.0   | 18.5   | 15.2             | 13                   | 1,400        | P271QH153M250(1)           | PME271Y515M(1)       |
| 0.0220                 | 7.3                      | 13.0   | 18.5   | 15.2             | 9.8                  | 1,400        | P271QM223M250(1)           | PME271Y522M(1)       |
| 0.0330                 | 7.6                      | 14.0   | 24.0   | 20.3             | 7.0                  | 1,000        | P271CE333M250(1)           | PME271Y533M(1)       |
| 0.0470                 | 9.0                      | 15.0   | 24.0   | 20.3             | 6.0                  | 1,000        | P271CJ473M250(1)           | PME271Y547M(1)       |
| 0.0680                 | 11.3                     | 16.5   | 24.0   | 20.3             | 4.6                  | 600          | P271CP683M250(1)           | PME271Y568M(1)       |
| 0.1000                 | 12.1                     | 19.0   | 30.5   | 25.4             | 3.9                  | 400          | P271EJ104M250(1)           | PME271Y610M(1)       |
| Capacitance Value (μF) | B (mm)                   | H (mm) | L (mm) | Lead Spacing (p) | f <sub>o</sub> (MHz) | dV/dt (V/μs) | KEMET Internal Part Number | Customer Part Number |

(1) Insert ordering code for lead type and packaging. See Ordering Options Table for available options.

## Soldering Process

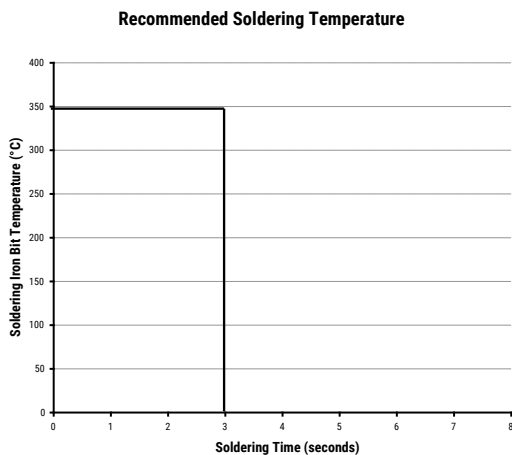
The implementation of the RoHS directive has resulted in the selection of SnAuCu (SAC) alloys or SnCu alloys as a primary solder. This has increased the liquidus temperature from 183°C for SnPb eutectic alloy to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave 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). Great care must be taken during soldering. The recommended solder profiles from KEMET should be used. Consult 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. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum of two soldering cycles is recommended. Allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

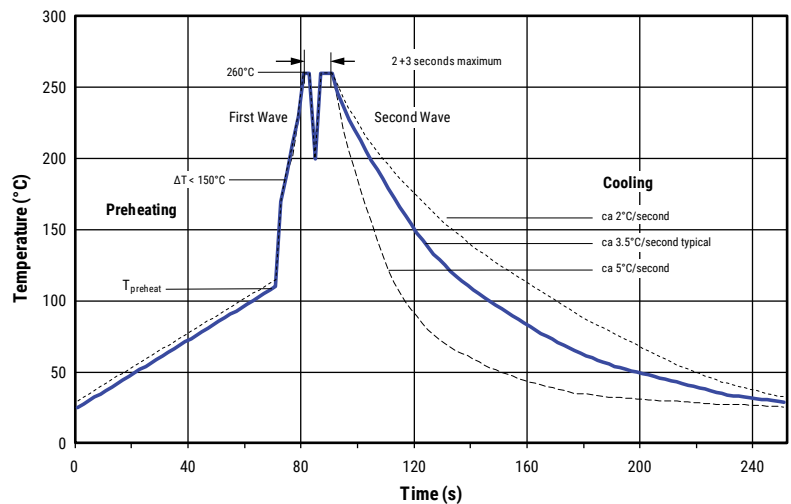
### Manual Soldering Recommendations

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



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.

### Wave Soldering Recommendations cont'd

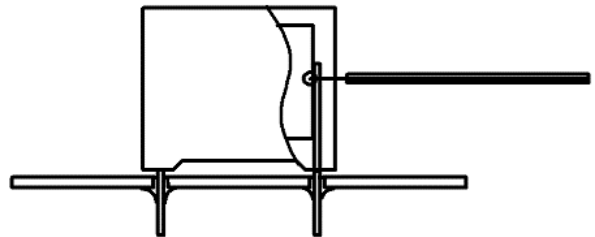
1. The table indicates the maximum setup temperature for the soldering process.

| 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.*

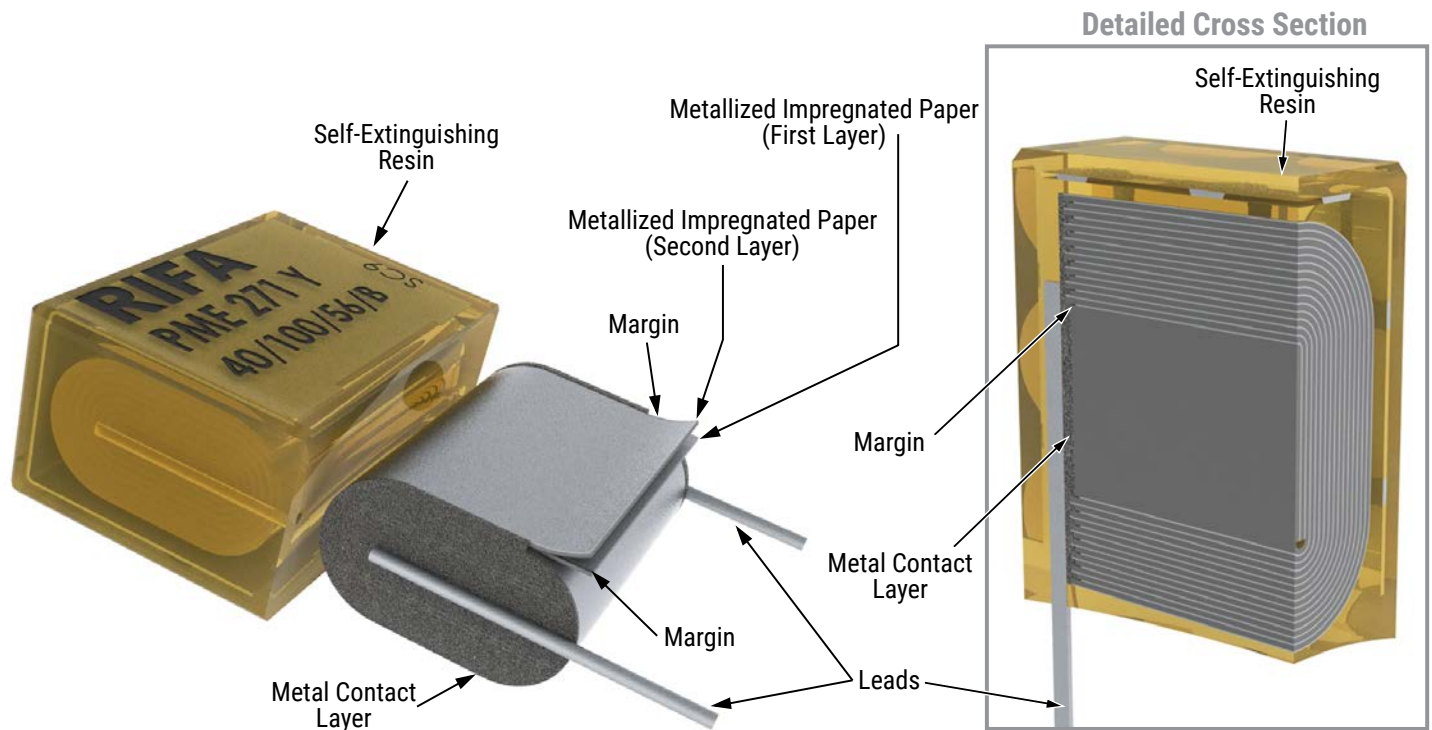


### Selective Soldering Recommendations

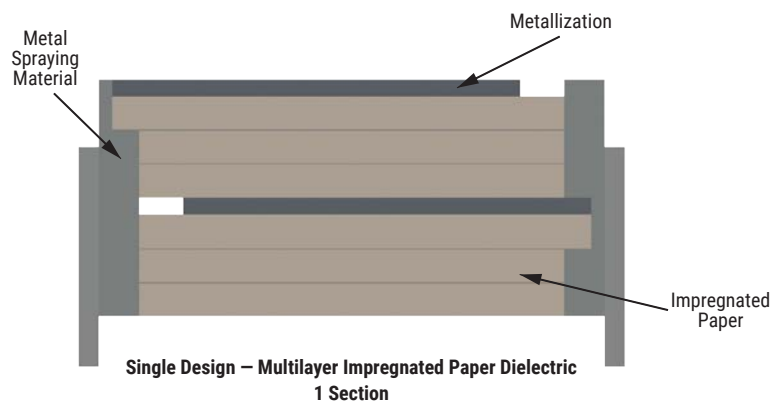
Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath, as in normal flow soldering, without touching the solder. When the board is over the bath, it is stopped. 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 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering. Great care must be taken so that the parts do not overheat.

## Construction

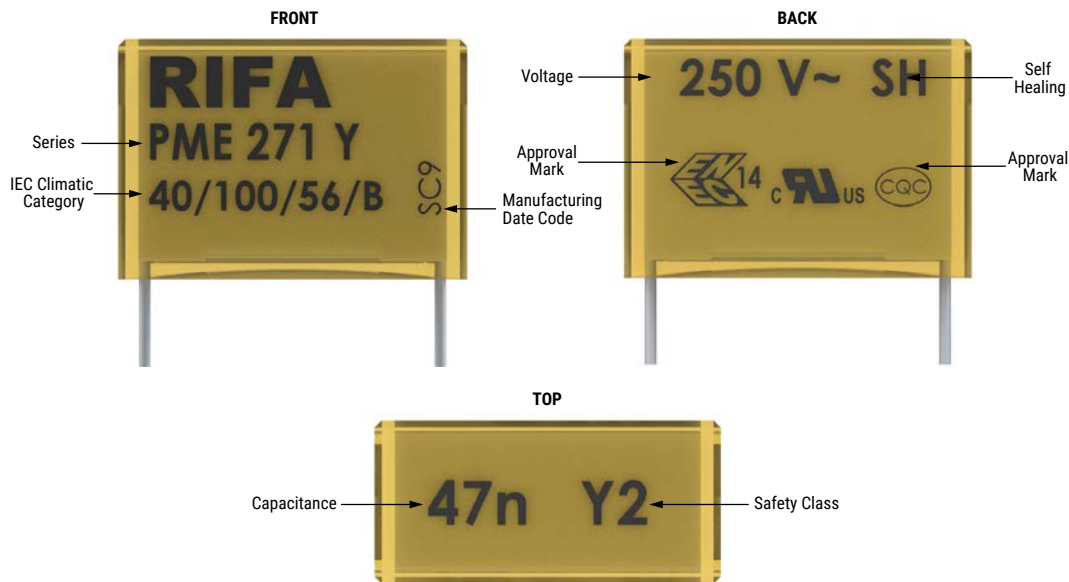


## Winding Scheme





## Marking

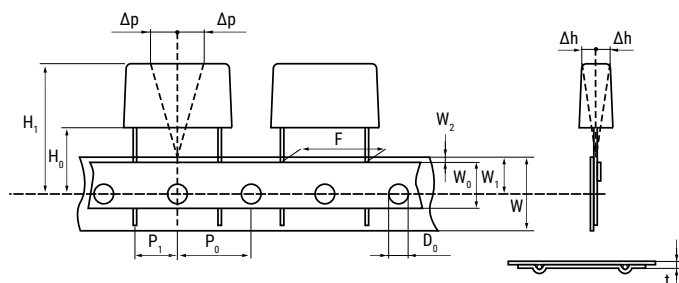


## Packaging Quantities

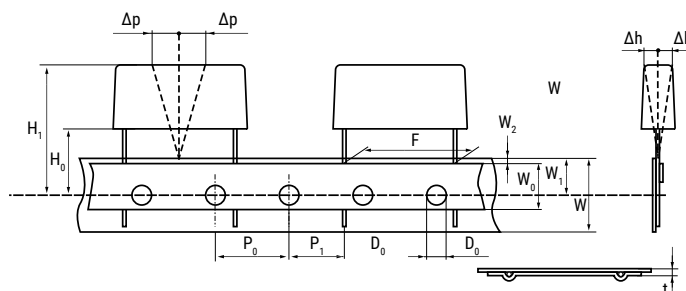
| Lead Spacing (mm) | Thickness (mm) | Height (mm) | Length (mm) | Bulk Short Leads | Bulk Long Leads | Standard Reel 360 mm | Large Reel 500 mm | Ammo Formed |
|-------------------|----------------|-------------|-------------|------------------|-----------------|----------------------|-------------------|-------------|
| 10.2              | 3.9            | 7.5         | 13.5        | 2,000            | 1,000           | 700                  | 1,400             | 800         |
|                   | 4.1            | 8.2         | 13.5        | 2,000            | 1,000           | 600                  |                   | 780         |
|                   | 5.1            | 10.5        | 13.5        | 1,600            | 800             | 600                  | 1,200             | 630         |
| 15.2              | 5.5            | 12.5        | 18.0        | 1,000            | 500             | 600                  |                   |             |
|                   | 6.5            | 12.5        | 18.0        | 600              | 400             | 400                  |                   |             |
|                   | 7.5            | 14.5        | 18.0        | 600              | 400             | 400                  |                   |             |
|                   | 8.5            | 16.0        | 18.0        | 400              | 250             | 400                  |                   |             |
|                   | 5.2            | 10.5        | 18.5        | 1,000            | 500             | 600                  |                   |             |
|                   | 5.5            | 11.0        | 18.5        | 1,000            | 500             | 500                  |                   |             |
|                   | 6.0            | 12.5        | 18.5        | 600              | 400             | 400                  |                   |             |
|                   | 7.3            | 13.0        | 18.5        | 600              | 400             | 400                  | 800               |             |
|                   | 7.8            | 13.5        | 18.5        | 600              | 400             | 400                  |                   |             |
| 20.3              | 7.6            | 14.0        | 24.0        | 1,500            | 250             | 250                  | 500               |             |
|                   | 8.4            | 14.0        | 24.0        | 1,200            | 200             | 250                  | 500               |             |
|                   | 9.0            | 15.0        | 24.0        | 1,500            | 200             | 250                  |                   |             |
|                   | 11.3           | 16.5        | 24.0        | 1,000            | 150             | 180                  | 400               |             |
| 25.4              | 10.6           | 16.1        | 30.5        | 1,000            | 150             |                      |                   |             |
|                   | 10.5           | 17.3        | 30.5        | 1,000            | 100             |                      |                   |             |
|                   | 12.1           | 19.0        | 30.5        | 800              | 100             |                      |                   |             |
|                   | 15.3           | 22.0        | 30.5        | 600              | 75              |                      |                   |             |

## Lead Taping & Packaging (IEC 60286-2)

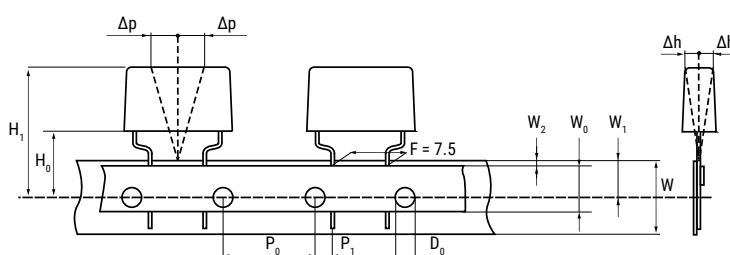
### Lead Spacing 10.2 – 15.2 mm



### Lead Spacing 20.3 – 22.5 mm



### Formed Leads from 10.2 – 7.5 mm



## Taping Specification

| Dimensions in mm              |           |                               |                     |          |          |          |             | Standard IEC 60286-2 |
|-------------------------------|-----------|-------------------------------|---------------------|----------|----------|----------|-------------|----------------------|
| Lead Spacing                  | +0.6/-0.1 | F                             | Formed 7.5          | 10.2     | 15.2     | 20.3     | 22.5        | F                    |
| Carrier Tape Width            | ±0.5      | W                             | 18                  | 18       | 18       | 18       | 18          | 18 +1/-0.5           |
| Hold-Down Tape Width          | Minimum   | W <sub>0</sub>                | 5                   | 5        | 5        | 5        | 5           |                      |
| Position of Sprocket Hole     | ±0.5      | W <sub>1</sub>                | 9                   | 9        | 9        | 9        | 9           | 9 +0.75/-0.5         |
| Distance Between Tapes        | Maximum   | W <sub>2</sub>                | 3                   | 3        | 3        | 3        | 3           | 3                    |
| Sprocket Hole Diameter        | ±0.2      | D <sub>0</sub>                | 4                   | 4        | 4        | 4        | 4           | 4                    |
| Feed Hole Lead Spacing        | ±0.3      | P <sub>0</sub> <sup>(1)</sup> | 12.7 <sup>(4)</sup> | 12.7     | 12.7     | 12.7     | 12.7        | 12.7                 |
| Distance Lead – Feed Hole     | ±0.7      | P <sub>1</sub>                | 3.75                | 7.6      | 5.1      | 8.9      | 5.3         | P <sup>1</sup>       |
| Deviation Tape – Plane        | Maximum   | Δp                            | 1.3                 | 1.3      | 1.3      | 1.3      | 1.3         | 1.3                  |
| Lateral Deviation             | Maximum   | Δh                            | 2                   | 2        | 2        | 2        | 2           | 2                    |
| Total Thickness               | ±0.2      | t                             | 0.7                 | 0.7      | 0.7      | 0.7      | 0.9 Maximum | 0.9 Maximum          |
| Sprocket Hole/Cap Body        | Nominal   | H <sub>0</sub> <sup>(2)</sup> | 18 +2/-0            | 18 +2/-0 | 18 +2/-0 | 18 +2/-0 | 18.5 ±0.5   | 18 +2/-0             |
| Sprocket Hole/Top of Cap Body | Maximum   | H <sub>1</sub> <sup>(3)</sup> | 43                  | 43       | 43       | 58       | 58          | 58 Maximum           |

(1) Maximum cumulative feed hole error, 1 mm per 20 parts

(2) 16.5 mm available on request

(3) Depending on case size

(4) 15 mm available on request

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Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели,  
кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



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