Polypropylene Pulse/High Frequency Capacitors

# R71H, 125°C Single Metallized Polypropylene Film, Radial, SMPS PFC Applications (Automotive Grade)

## Overview

The R71H is constructed of metallized polypropylene film with radial leads of tinned wire. The radial leads are electrically welded to the metal layer on the ends of the capacitor winding. The capacitor is encapsulated in a self-extinguishing solvent resistant plastic case with thermosetting resin material meeting UL 94 V–0 requirements.

Automotive grade devices meet the demanding Automotive Electronics Council's AEC–Q200 qualification requirements.

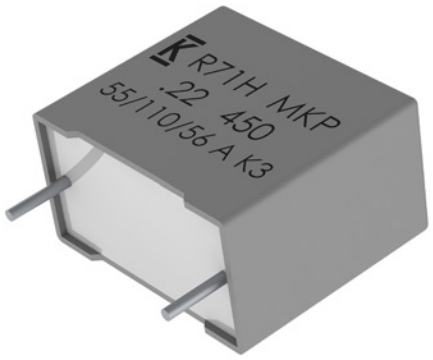
## Applications

Typical applications include power factor correction applications.

Not suitable for across-the-line application (see Suppressor Capacitors).

## Benefits

- Voltage range: 450 – 630 VDC
- Capacitance range: 0.033 – 22 µF
- Lead Spacing: 10 – 27.5 mm
- Capacitance tolerance: ±10%, ±20%, ±5% (on request)
- Climatic category: 55/110/56 IEC 60068–1
- Operating temperature range of –55°C to +125°C
- RoHS compliance and lead-free terminations
- Tape & Reel packaging in accordance with IEC 60286–2
- Self-healing
- Automotive (AEC–Q200) grade




## Part Number System

| R71 | X | I | 4100 | AA | H0 | | K |
|---|---|---|---|---|---|---|---|
| Series | Rated Voltage (VDC) | Lead Spacing (mm) | Capacitance Code (pF) | Packaging | Internal Use | | Capacitance Tolerance |
| Metallized Polypropylene | X = 450<br>V = 520<br>P = 630 | F = 10<br>I = 15<br>N = 22.5<br>R = 27.5 | The last three digits represent significant figures. The first digit specifies the total number of zeros to be added. | See Ordering Options Table | H0<br>H1<br>H2<br>H3 | H4<br>H5<br>H6<br>H7 | J = ±5%<br>K = ±10%<br>M = ±20% |



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## Ordering Options Table

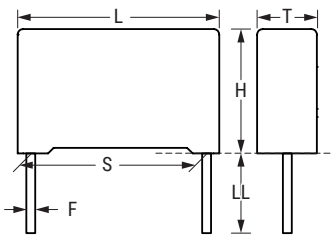
| Lead Spacing Nominal (mm) | Type of Leads and Packaging | Lead Length (mm) | Lead and Packaging Code |
|---|---|---|---|
| 10<br>15<br>22.5 | **Standard Lead and Packaging Options** | | |
| | Bulk (Bag)[2] – Short Leads | 4 +2/–0 | AA |
| | Ammo Pack | $H_0$ = 18.5±0.5 | DQ |
| | **Other Lead and Packaging Options** | | |
| | Tape & Reel (Standard Reel Ø 355 mm) | $H_0$ = 18.5±0.5 | GY |
| | Tape & Reel (Large Reel Ø 500 mm) | $H_0$ = 18.5±0.5 | CK |
| | Bulk (Bag)[2] – Short Leads | 3.5 +0.5/–0 | JB |
| | Bulk (Bag)[2] – Short Leads | 4.0 +0.5/–0 | JE |
| | Bulk (Bag)[2] – Short Leads | 3.2 +0.3/–0.2 | JH |
| | Bulk (Bag) – Long Leads | 18±1 | JM |
| | Bulk (Bag) – Long Leads | 30 +5/–0 | 40 |
| | Bulk (Bag) – Long Leads | 25 +2/–1 | 50 |
| 27.5 | **Standard Lead and Packaging Options** | | |
| | Bulk (Tray) – Short Leads | 4 +2/–0 | AA |
| | **Other Lead and Packaging Options** | | |
| | Tape & Reel (Standard Reel Ø 355 mm) | $H_0$ = 18.5±0.5 | GY |
| | Tape & Reel (Large Reel Ø 500 mm) | $H_0$ = 18.5±0.5 | CK[1] |
| | Bulk (Tray) – Short Leads | 3.5 +0.5/–0 | JB |
| | Bulk (Tray) – Short Leads | 4.0 +0.5/–0 | JE |
| | Bulk (Tray) – Short Leads | 3.2 +0.3/–0.2 | JH |
| | Bulk (Tray) – Long Leads | 18±1 | JM |
| | Bulk (Tray) – Long Leads | 30 +5/–0 | 40 |
| | Bulk (Tray) – Long Leads | 25 +2/–1 | 50 |

*[1] = Not for all sizes, see "Packaging Quantities" table.*

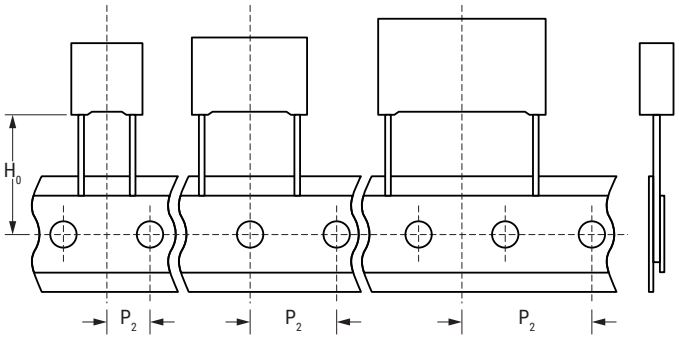
*[2] = For lead spacing 22.5 case sizes ≥ 8.5*17*26.5 the parts are packed in a Pizza box 335*320*34 mm*

## Dimensions – Millimeters

**Loose**




**Taped**




| S | | T | | H | | L | | F | |
|---|---|---|---|---|---|---|---|---|---|
| Nominal | Tolerance | Nominal | Tolerance | Nominal | Tolerance | Nominal | Tolerance | Nominal | Tolerance |
| 10.0 | ±0.4 | 4.0 | +0.2/-0.5 | 9.0 | +0.1/-0.5 | 13.0 | +0.2/-0.5 | 0.6 | ±0.05 |
| 10.0 | ±0.4 | 5.0 | +0.2/-0.5 | 11.0 | +0.1/-0.5 | 13.0 | +0.2/-0.5 | 0.6 | ±0.05 |
| 10.0 | ±0.4 | 6.0 | +0.2/-0.5 | 12.0 | +0.1/-0.5 | 13.0 | +0.2/-0.5 | 0.6 | ±0.05 |
| 15.0 | ± 0.4 | 5.0 | +0.2/-0.5 | 11.0 | +0.1/-0.5 | 18.0 | +0.3/-0.5 | 0.8 | ±0.05 |
| 15.0 | ±0.4 | 6.0 | +0.2/-0.5 | 12.0 | +0.1/-0.5 | 18.0 | +0.3/-0.5 | 0.8 | ±0.05 |
| 15.0 | ±0.4 | 6.0 | +0.2/-0.5 | 17.5 | +0.1/-0.5 | 18.0 | +0.3/-0.5 | 0.8 | ±0.05 |
| 15.0 | ±0.4 | 7.5 | +0.2/-0.5 | 13.5 | +0.1/-0.5 | 18.0 | +0.5/-0.5 | 0.8 | ±0.05 |
| 15.0 | ±0.4 | 7.5 | +0.2/-0.5 | 18.5 | +0.1/-0.5 | 18.0 | +0.5/-0.5 | 0.8 | ±0.05 |
| 15.0 | ±0.4 | 8.5 | +0.2/-0.5 | 14.5 | +0.1/-0.5 | 18.0 | +0.5/-0.5 | 0.8 | ±0.05 |
| 15.0 | ±0.4 | 9.0 | +0.2/-0.5 | 12.5 | +0.1/-0.5 | 18.0 | +0.5/-0.5 | 0.8 | ±0.05 |
| 15.0 | ±0.4 | 10.0 | +0.2/-0.5 | 16.0 | +0.1/-0.5 | 18.0 | +0.5/-0.5 | 0.8 | ±0.05 |
| 15.0 | ±0.4 | 11.0 | +0.2/-0.5 | 19.0 | +0.1/-0.5 | 18.0 | +0.5/-0.5 | 0.8 | ±0.05 |
| 15.0 | ±0.4 | 13.0 | +0.2/-0.5 | 12.0 | +0.1/-0.5 | 18.0 | +0.5/-0.5 | 0.8 | ±0.05 |
| 22.5 | ±0.4 | 6.0 | +0.2/-0.5 | 15.0 | +0.1/-0.5 | 26.5 | +0.3/-0.5 | 0.8 | ± 0.05 |
| 22.5 | ±0.4 | 7.0 | +0.2/-0.5 | 16.0 | +0.1/-0.5 | 26.5 | +0.3/-0.5 | 0.8 | ±0.05 |
| 22.5 | ±0.4 | 8.5 | +0.2/-0.5 | 17.0 | +0.1/-0.5 | 26.5 | +0.3/-0.5 | 0.8 | ±0.05 |
| 22.5 | ±0.4 | 10.0 | +0.2/-0.5 | 18.5 | +0.1/-0.5 | 26.5 | +0.3/-0.5 | 0.8 | ±0.05 |
| 22.5 | ±0.4 | 11.0 | +0.2/-0.5 | 20.0 | +0.1/-0.5 | 26.5 | +0.3/-0.5 | 0.8 | ±0.05 |
| 22.5 | ±0.4 | 13.0 | +0.2/-0.5 | 22.0 | +0.1/-0.5 | 26.5 | +0.3/-0.5 | 0.8 | ±0.05 |
| 27.5 | ±0.4 | 9.0 | +0.2/-0.7 | 17.0 | +0.1/-0.7 | 32.0 | +0.3/-0.7 | 0.8 | ±0.05 |
| 27.5 | ±0.4 | 11.0 | +0.2/-0.7 | 20.0 | +0.1/-0.7 | 32.0 | +0.3/-0.7 | 0.8 | ±0.05 |
| 27.5 | ±0.4 | 13.0 | +0.2/-0.7 | 22.0 | +0.1/-0.7 | 32.0 | +0.3/-0.7 | 0.8 | ±0.05 |
| 27.5 | ±0.4 | 13.0 | +0.2/-0.7 | 25.0 | +0.1/-0.7 | 32.0 | +0.3/-0.7 | 0.8 | ±0.05 |
| 27.5 | ±0.4 | 14.0 | +0.2/-0.7 | 28.0 | +0.1/-0.7 | 32.0 | +0.3/-0.7 | 0.8 | ±0.05 |
| 27.5 | ±0.4 | 16.0 | +0.2/-0.7 | 30.0 | +0.1/-0.7 | 32.0 | +0.3/-0.7 | 0.8 | ±0.05 |
| 27.5 | ±0.4 | 18.0 | +0.2/-0.7 | 33.0 | +0.1/-0.7 | 32.0 | +0.3/-0.7 | 0.8 | ±0.05 |
| 27.5 | ±0.4 | 22.0 | +0.2/-0.7 | 37.0 | +0.1/-0.7 | 32.0 | +0.3/-0.7 | 0.8 | ±0.05 |

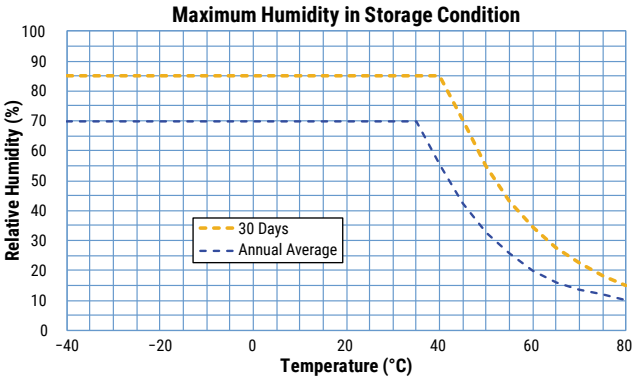
**Note: See Ordering Options Table for lead length (LL/$H_0$) options.**

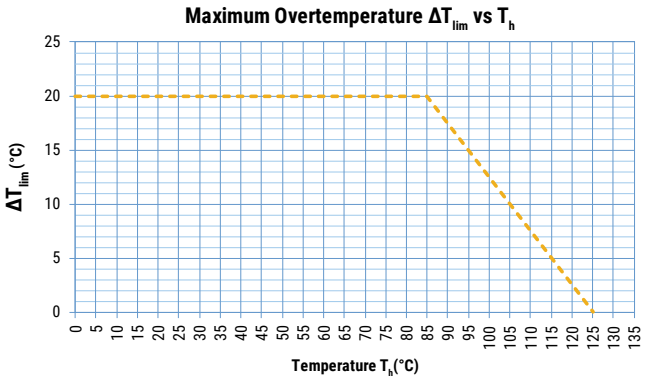
## Performance Characteristics

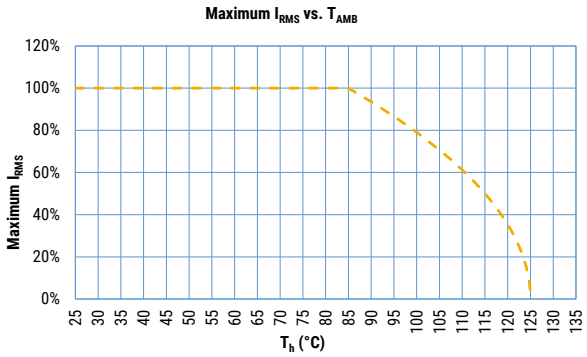
| | | | | | |
|---|---|---|---|---|---|
| Dielectric | Polypropylene film | | | | |
| Plates | Metal layer deposited by evaporation under vacum | | | | |
| Winding | Non-inductive type | | | | |
| Leads | Tinned wire | | | | |
| Protection | Plastic case, thermosetting resin filled. Box material is solvent resistant and flame retardant according to UL94. | | | | |
| Rated Voltage $V_R$ | 450 VDC<br>160 VAC | | 520 VDC<br>200 VAC | | 630 VDC<br>220 VAC |
| Capacitance Range (µF) | 0.1 – 22 | | 0.1 – 15 | | 0.033 – 10 |
| Capacitance Values | E12 series (IEC 60063) measured at 1 kHz and +20 ±1°C | | | | |
| Capacitance Tolerance | ±10%, ±20%, ±5% on request | | | | |
| Operating Temperature Range | −55°C to +125°C | | | | |
| Rated Temperature $T_R$ | +85°C | | | | |
| Voltage Derating | The following decreasing factor has to be applied on the rated voltage:<br>+85°C to 125°C: 1.25% per °C for $V_R$ (DC and AC) = operating voltage $V_{op}$ | | | | |
| Climatic Category | 55/110/56 IEC 60068–1 | | | | |
| Storage Conditions | Storage time: ≤ 24 months from the date marked on the package label | | | | |
| | Average relative humidity per year ≤ 70% | | | | |
| | RH ≤ 85% for 30 days randomly distributed throughout the year | | | | |
| | Dew is absent | | | | |
| | Temperature: −40 to 80°C (see "Maximum Humidity in Storage Conditions" graph below) | | | | |
| Test Voltage | 1.5 x $V_R$ VDC for 2 seconds (between terminations) at +25°C ±5°C | | | | |
| Capacitance Drift | Maximum 0.5% after a 2 year storage period at a temperature of +10°C to +40°C and a relative humidity of 40% to 60% | | | | |
| Maximum Pulse Steepness | dV/dt according to Table 1. For working voltages lower than rated voltage ($V < V_R$), the specified dV/dt can be multiplied by the factor $V_R/V$. | | | | |
| Temperature Coefficient | −(200±100) ppm/°C at 1 kHz | | | | |
| Self-Inductance (Lead Length ~ 2 mm) | Lead Spacing (mm) | 10 | 15 | 22.5 | 27.5 |
| | L (nH) ≈ | 9 | 10 | 16 | 18 |
| | Maximum 1 nH per 1 mm lead and capacitor length. | | | | |
| Dissipation Factor (tanδ) at 1 kHz at 25°C ±5°C | for C ≤ 2.2 µF: ≤ 0.1% (0.04%)* | | | | |
| | for C > 2.2 µF: ≤ 0.15% (0.06%)* | | | | |
| Insulation Resistance | Measured at +25°C, 100 VDC 60 seconds | | | | |
| | Minimum Values Between Terminals | | | | |
| | C ≤ 0.33 µF | | | C > 0.33 µF | |
| | ≥ 100,000 MΩ<br>(≥ 500,000 MΩ)* | | | ≥ 30,000 MΩ • µF<br>(≥ 150,000 MΩ • µF)* | |

** Typical value*

## Performance Characteristics cont.



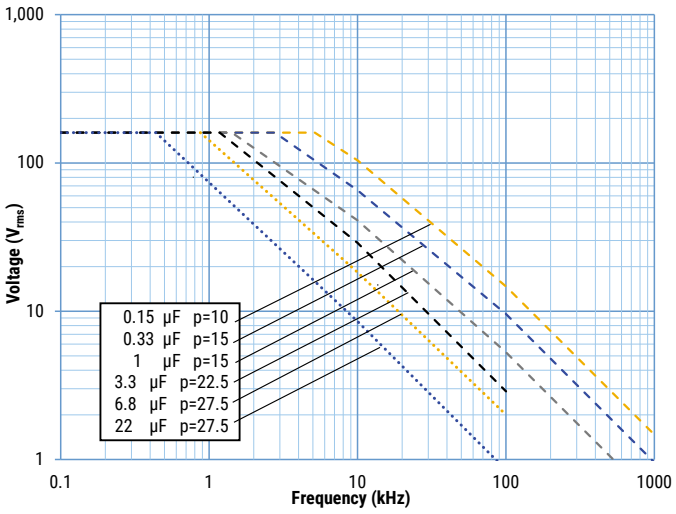

*$T_h$ is the maximum ambient temperature surrounding the capacitor or hottest contact point (e.g. tracks), whichever is higher, in the worst operation conditions in °C.*

## Qualification

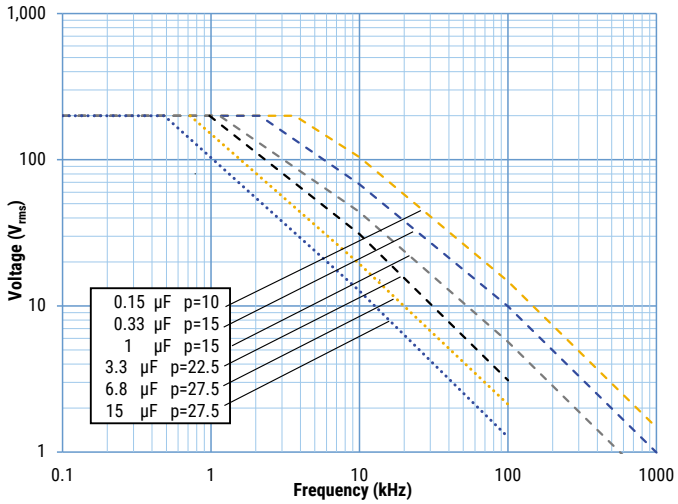
Automotive Grade products meet or exceed the requirements outlined by the Automotive Electronics Council. Details regarding test methods and conditions are referenced in document AEC–Q200, Stress Test Qualification for Passive Components. For additional information regarding the Automotive Electronics Council and AEC–Q200, please visit their website at www.aecouncil.com.

# Maximum Voltage ($V_{rms}$) Versus Frequency (Sinusoidal Waveform/Th ≤ 85°C)

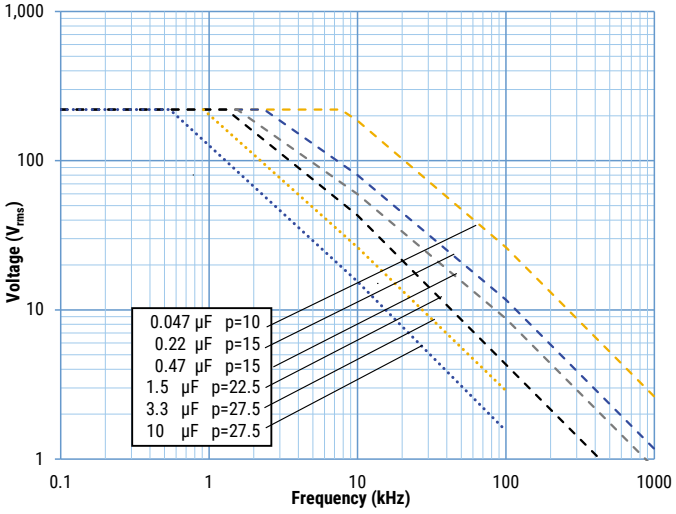
**450 VDC/160 VAC**




**520 VDC/200 VAC**

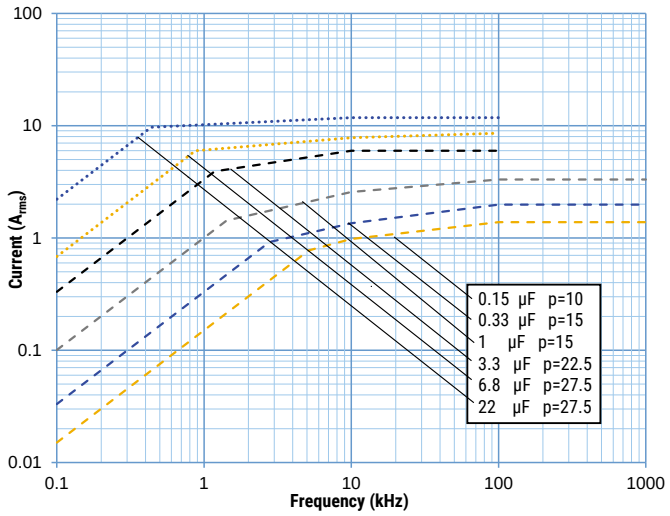



**630 VDC/220 VAC**

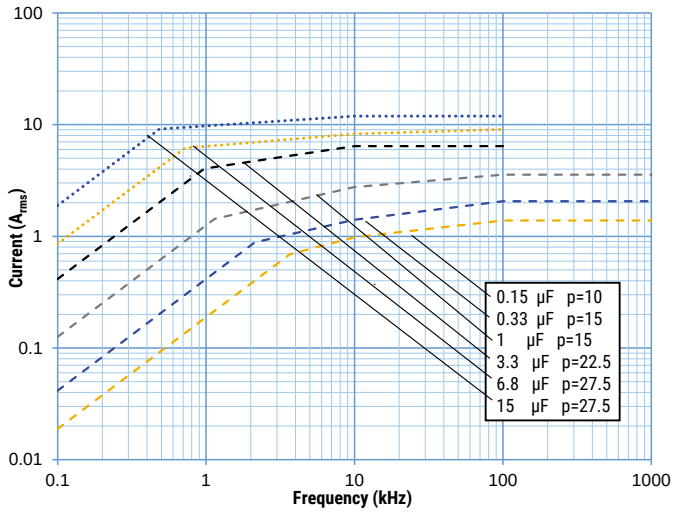


# Maximum Current ($I_{rms}$) Versus Frequency (Sinusoidal Waveform/Th ≤ 85°C)

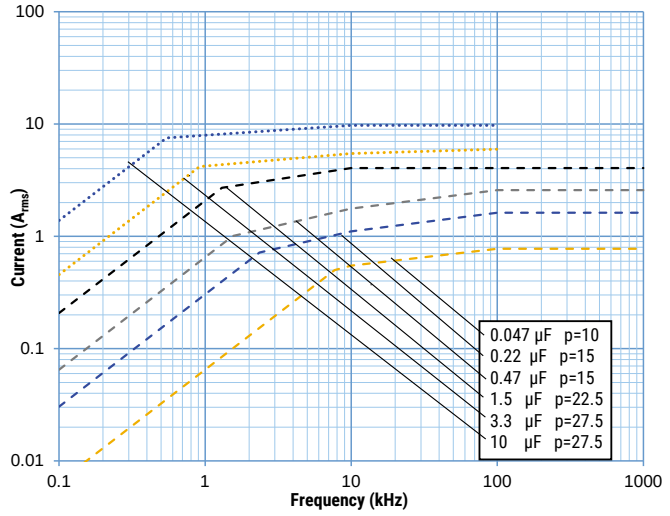
**450 VDC/160 VAC**




**520 VDC/200 VAC**




**630 VDC/220 VAC**



## Environmental Test Data

| Damp Heat, Steady State Test | Test Conditions: | | Performances |
|---|---|---|---|
| | Temperature:<br>Relative humidity (RH):<br>Test duration: | +40°C ±2°C<br>93% ±2%<br>56 days | \|Δ C/C\| ≤ 5%,<br>IR after test ≥ 50% of initial limit |
| **Endurance Test** | **Test Conditions** | | **Performances** |
| | Temperature:<br>Voltage applied:<br>Test duration: | +105°C ±2°C<br>1.0 x $V_{OP}$ (DC, AC 50/60 Hz)<br>1,000 hours | \|Δ C/C\| ≤ 5%,<br>IR after test ≥ 50% of initial limit |
| | Temperature:<br>Voltage applied:<br>Test duration: | +125°C ±2°C<br>1.0 x $V_{OP}$ (DC, AC 50/60 Hz)<br>1,000 hours | \|Δ C/C\| ≤ 5%,<br>IR after test ≥ 50% of initial limit |
| | Temperature:<br>Relative humidity (RH):<br>Voltage applied:<br>Test duration: | +40°C ±2°C<br>93% ±2%<br>1.0 x VR (DC)<br>1,000 hours | \|Δ C/C\| ≤ 10%,<br>Δ tanδ ≤ 0.001 at 1 kHz<br>IR after test ≥ 50% of initial limit |
| **Resistance to Soldering Heat Test** | **Test Conditions** | | **Performances** |
| | Solder bath temperature:<br>Dipping time (with heat screen): | 260°C ±5°C<br>10 seconds ±1 second | \|Δ C/C\| ≤ 2% |

## Environmental Compliance

All KEMET pulse capacitors are RoHS compliant.

## Table 1 – Ratings & Part Number Reference

| VDC | VAC | Cap Value (µF) | Dimensions in mm | | | Lead Spacing (S) | Ød (mm) | dV/dt (V/µs) | Max $K_0$ ($V^2$/µs) | $I_{pkr}$ | ESL | ESR max | $I_{rms}$ max (*) | Rth | KEMET Part Number | Customer Part Number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | T | H | L | | | | | $A_{pk}$ | Lead Length 2x4 mm nH | at 100 kHz mΩ | at 100 kHz, 85°C $A_{rms}$ | (°C/W) | | |
| 450 | 160 | 0.10 | 4.0 | 9.0 | 13.0 | 10.0 | 0.6 | 150 | 135,000 | 15.0 | 9 | 199 | 1.1 | 79 | 71XF3100(1)H0(2) | R71XF3100(1)H0(2) |
| 450 | 160 | 0.15 | 4.0 | 9.0 | 13.0 | 10.0 | 0.6 | 150 | 135,000 | 22.5 | 9 | 133 | 1.39 | 79 | 71XF3150(1)H0(2) | R71XF3150(1)H0(2) |
| 450 | 160 | 0.22 | 5.0 | 11.0 | 13.0 | 10.0 | 0.6 | 150 | 135,000 | 33.0 | 9 | 90 | 1.79 | 69 | 71XF3220(1)H0(2) | R71XF3220(1)H0(2) |
| 450 | 160 | 0.33 | 6.0 | 12.0 | 13.0 | 10.0 | 0.6 | 150 | 135,000 | 49.5 | 9 | 60 | 2.28 | 64 | 71XF3330(1)H0(2) | R71XF3330(1)H0(2) |
| 450 | 160 | 0.47 | 6.0 | 12.0 | 13.0 | 10.0 | 0.6 | 150 | 135,000 | 70.5 | 9 | 42 | 2.72 | 64 | 71XF3470(1)H0(3) | R71XF3470(1)H0(3) |
| 450 | 160 | 0.33 | 5.0 | 11.0 | 18.0 | 15.0 | 0.8 | 100 | 90,000 | 33.0 | 10 | 84 | 1.98 | 60 | 71XI3330(1)H0(2) | R71XI3330(1)H0(2) |
| 450 | 160 | 0.47 | 6.0 | 12.0 | 18.0 | 15.0 | 0.8 | 100 | 90,000 | 47.0 | 10 | 59 | 2.46 | 56 | 71XI3470(1)H0(2) | R71XI3470(1)H0(2) |
| 450 | 160 | 0.68 | 6.0 | 12.0 | 18.0 | 15.0 | 0.8 | 100 | 90,000 | 68.0 | 10 | 53 | 2.61 | 56 | 71XI3680(1)H0(2) | R71XI3680(1)H0(2) |
| 450 | 160 | 1.0 | 7.5 | 13.5 | 18.0 | 15.0 | 0.8 | 100 | 90,000 | 100.0 | 10 | 36 | 3.32 | 51 | 71XI4100(1)H0(2) | R71XI4100(1)H0(2) |
| 450 | 160 | 1.5 | 10.0 | 16.0 | 18.0 | 15.0 | 0.8 | 100 | 90,000 | 150.0 | 10 | 27 | 4.14 | 44 | 71XI4150(1)H0(2) | R71XI4150(1)H0(2) |
| 450 | 160 | 2.2 | 11.0 | 19.0 | 18.0 | 15.0 | 0.8 | 100 | 90,000 | 220.0 | 10 | 18 | 5.24 | 40 | 71XI4220(1)H0(2) | R71XI4220(1)H0(2) |
| 450 | 160 | 1.0 | 6.0 | 15.0 | 26.5 | 22.5 | 0.8 | 70 | 63,000 | 70.0 | 16 | 51 | 3.01 | 43 | 71XN4100(1)H0(2) | R71XN4100(1)H0(2) |
| 450 | 160 | 1.5 | 7.0 | 16.0 | 26.5 | 22.5 | 0.8 | 70 | 63,000 | 105.0 | 16 | 34 | 3.79 | 41 | 71XN4150(1)H0(2) | R71XN4150(1)H0(2) |
| 450 | 160 | 2.2 | 8.5 | 17.0 | 26.5 | 22.5 | 0.8 | 70 | 63,000 | 154.0 | 16 | 23 | 4.74 | 38 | 71XN4220(1)H0(2) | R71XN4220(1)H0(2) |
| 450 | 160 | 3.3 | 10.0 | 18.5 | 26.5 | 22.5 | 0.8 | 70 | 63,000 | 231.0 | 16 | 15 | 6.02 | 36 | 71XN4330(1)H0(2) | R71XN4330(1)H0(2) |
| 450 | 160 | 4.7 | 13.0 | 22.0 | 26.5 | 22.5 | 0.8 | 70 | 63,000 | 329.0 | 16 | 11 | 7.67 | 31 | 71XN4470(1)H0(2) | R71XN4470(1)H0(2) |
| 450 | 160 | 2.2 | 9.0 | 17.0 | 32.0 | 27.5 | 0.8 | 50 | 45,000 | 110.0 | 18 | 29 | 4.45 | 35 | 71XR4220(1)H0(2) | R71XR4220(1)H0(2) |
| 450 | 160 | 3.3 | 9.0 | 17.0 | 32.0 | 27.5 | 0.8 | 50 | 45,000 | 165.0 | 18 | 19 | 5.45 | 35 | 71XR4330(1)H0(2) | R71XR4330(1)H0(2) |
| 450 | 160 | 4.7 | 11.0 | 20.0 | 32.0 | 27.5 | 0.8 | 50 | 45,000 | 235.0 | 18 | 14 | 6.86 | 31 | 71XR4470(1)H0(2) | R71XR4470(1)H0(2) |
| 450 | 160 | 6.8 | 13.0 | 22.0 | 32.0 | 27.5 | 0.8 | 50 | 45,000 | 340.0 | 18 | 9 | 8.57 | 29 | 71XR4680(1)H0(2) | R71XR4680(1)H0(2) |
| 450 | 160 | 10 | 14.0 | 28.0 | 32.0 | 27.5 | 0.8 | 50 | 45,000 | 500.0 | 18 | 10 | 8.68 | 26 | 71XR5100(1)H0(2) | R71XR5100(1)H0(2) |
| 450 | 160 | 15 | 18.0 | 33.0 | 32.0 | 27.5 | 0.8 | 50 | 45,000 | 750.0 | 18 | 7 | 11.33 | 23 | 71XR5150(1)H0(2) | R71XR5150(1)H0(2) |
| 450 | 160 | 22 | 22.0 | 37.0 | 32.0 | 27.5 | 0.8 | 50 | 45,000 | 1,100.0 | 18 | 7 | 11.78 | 21 | 71XR5220(1)H0(2) | R71XR5220(1)H0(2) |
| 520 | 200 | 0.10 | 4.0 | 9.0 | 13.0 | 10.0 | 0.6 | 200 | 208,000 | 20.0 | 9 | 199 | 1.13 | 79 | 71VF3100(1)H6(2) | R71VF3100(1)H6(2) |
| 520 | 200 | 0.15 | 5.0 | 11.0 | 13.0 | 10.0 | 0.6 | 200 | 208,000 | 30.0 | 9 | 133 | 1.48 | 69 | 71VF3150(1)H6(2) | R71VF3150(1)H6(2) |
| 520 | 200 | 0.22 | 6.0 | 12.0 | 13.0 | 10.0 | 0.6 | 200 | 208,000 | 44.0 | 9 | 90 | 1.86 | 64 | 71VF3220(1)H6(2) | R71VF3220(1)H6(2) |
| 520 | 200 | 0.22 | 5.0 | 11.0 | 18.0 | 15.0 | 0.8 | 140 | 145,600 | 30.8 | 10 | 127 | 1.62 | 60 | 71VI3220(1)H6(2) | R71VI3220(1)H6(2) |
| 520 | 200 | 0.33 | 6.0 | 12.0 | 18.0 | 15.0 | 0.8 | 140 | 145,600 | 46.2 | 10 | 84 | 2.06 | 56 | 71VI3330(1)H6(2) | R71VI3330(1)H6(2) |
| 520 | 200 | 0.47 | 6.0 | 12.0 | 18.0 | 15.0 | 0.8 | 140 | 145,600 | 65.8 | 10 | 59 | 2.46 | 56 | 71VI3470(1)H6(2) | R71VI3470(1)H6(2) |
| 520 | 200 | 0.68 | 7.5 | 13.5 | 18.0 | 15.0 | 0.8 | 140 | 145,600 | 95.2 | 10 | 53 | 2.74 | 51 | 71VI3680(1)H6(2) | R71VI3680(1)H6(2) |
| 520 | 200 | 1.0 | 10.0 | 16.0 | 18.0 | 15.0 | 0.8 | 140 | 145,600 | 140.0 | 10 | 36 | 3.56 | 44 | 71VI4100(1)H6(2) | R71VI4100(1)H6(2) |
| 520 | 200 | 1.5 | 11.0 | 19.0 | 18.0 | 15.0 | 0.8 | 140 | 145,600 | 210.0 | 10 | 27 | 4.33 | 40 | 71VI4150(1)H6(2) | R71VI4150(1)H6(2) |
| 520 | 200 | 1.0 | 7.0 | 16.0 | 26.5 | 22.5 | 0.8 | 85 | 88,400 | 85.0 | 16 | 51 | 3.09 | 41 | 71VN4100(1)H6(2) | R71VN4100(1)H6(2) |
| 520 | 200 | 1.5 | 8.5 | 17.0 | 26.5 | 22.5 | 0.8 | 85 | 88,400 | 127.5 | 16 | 34 | 3.92 | 38 | 71VN4150(1)H6(2) | R71VN4150(1)H6(2) |
| VDC | VAC | Cap Value | T | H | L | Lead Spacing (S) | Ød (mm) | dV/dt (V/µs) | Max $K_0$ ($V^2$/µs) | $A_{pk}$ | Lead Length | at 100 kHz | at 100 kHz, 85°C | (°C/W) | KEMET Part Number | Customer Part Number |
| | | | | | | | | | | $I_{pkr}$ | ESL | ESR | $I_{rms}$ max (*) | $R_{th}$ | | |

*(1) Insert lead and packaging code. See table for available options.*
*(2) J=5%, K = 10%, M = 20%*
*(3) M = ±20% (only available tolerance)*
*(4) K = 10%, M = ±20% (only available tolerance)*

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

| VDC | VAC | Cap Value (µF) | Dimensions in mm | | | Lead Spacing (S) | Ød (mm) | dV/dt (V/µs) | Max $K_0$ ($V^2$/µs) | $I_{pkr}$ | ESL | ESR max | $I_{rms}$ max (*) | Rth | KEMET Part Number | Customer Part Number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | T | H | L | | | | | $A_{pk}$ | Lead Length 2x4 mm | at 100 kHz | at 100 kHz, 85°C | | | |
| | | | | | | | | | | | nH | mΩ | $A_{rms}$ | (°C/W) | | |
| 520 | 200 | 2.2 | 10.0 | 18.5 | 26.5 | 22.5 | 0.8 | 85 | 88,400 | 187.0 | 16 | 23 | 4.91 | 36 | 71VN4220(1)H6(2) | R71VN4220(1)H6(2) |
| 520 | 200 | 3.3 | 13.0 | 22.0 | 26.5 | 22.5 | 0.8 | 85 | 88,400 | 280.5 | 16 | 15 | 6.43 | 31 | 71VN4330(1)H6(2) | R71VN4330(1)H6(2) |
| 520 | 200 | 2.2 | 9.0 | 17.0 | 32.0 | 27.5 | 0.8 | 70 | 72,800 | 154.0 | 18 | 29 | 4.45 | 35 | 71VR4220(1)H6(2) | R71VR4220(1)H6(2) |
| 520 | 200 | 3.3 | 11.0 | 20.0 | 32.0 | 27.5 | 0.8 | 70 | 72,800 | 231.0 | 18 | 19 | 5.75 | 31 | 71VR4330(1)H6(2) | R71VR4330(1)H6(2) |
| 520 | 200 | 4.7 | 13.0 | 22.0 | 32.0 | 27.5 | 0.8 | 70 | 72,800 | 329.0 | 18 | 14 | 7.13 | 29 | 71VR4470(1)H6(2) | R71VR4470(1)H6(2) |
| 520 | 200 | 6.8 | 14.0 | 28.0 | 32.0 | 27.5 | 0.8 | 70 | 72,800 | 476.0 | 18 | 9 | 9.05 | 26 | 71VR4680(1)H6(2) | R71VR4680(1)H6(2) |
| 520 | 200 | 10 | 18.0 | 33.0 | 32.0 | 27.5 | 0.8 | 70 | 72,800 | 700.0 | 18 | 10 | 9.25 | 23 | 71VR5100(1)H6(2) | R71VR5100(1)H6(2) |
| 520 | 200 | 15 | 22.0 | 37.0 | 32.0 | 27.5 | 0.8 | 70 | 72,800 | 1,050.0 | 18 | 7 | 11.91 | 21 | 71VR5150(1)H6(2) | R71VR5150(1)H6(2) |
| 630 | 220 | 0.033 | 4.0 | 9.0 | 13.0 | 10.0 | 0.6 | 260 | 327,600 | 8.6 | 9 | 603 | 0.65 | 79 | 71PF2330(1)H6(2) | R71PF2330(1)H6(2) |
| 630 | 220 | 0.047 | 4.0 | 9.0 | 13.0 | 10.0 | 0.6 | 260 | 327,600 | 12.2 | 9 | 423 | 0.78 | 79 | 71PF2470(1)H6(2) | R71PF2470(1)H6(2) |
| 630 | 220 | 0.068 | 4.0 | 9.0 | 13.0 | 10.0 | 0.6 | 260 | 327,600 | 17.7 | 9 | 293 | 0.93 | 79 | 71PF2680(1)H6(2) | R71PF2680(1)H6(2) |
| 630 | 220 | 0.10 | 5.0 | 11.0 | 13.0 | 10.0 | 0.6 | 260 | 327,600 | 26.0 | 9 | 199 | 1.21 | 69 | 71PF3100(1)H6(2) | R71PF3100(1)H6(2) |
| 630 | 220 | 0.15 | 6.0 | 12.0 | 13.0 | 10.0 | 0.6 | 260 | 327,600 | 39.0 | 9 | 133 | 1.54 | 64 | 71PF3150(1)H6(2) | R71PF3150(1)H6(2) |
| 630 | 220 | 0.22 | 6.0 | 12.0 | 13.0 | 10.0 | 0.6 | 260 | 327,600 | 57.2 | 9 | 90 | 1.86 | 64 | 71PF3220(1)H6(3) | R71PF3220(1)H6(3) |
| 630 | 220 | 0.15 | 5.0 | 11.0 | 18.0 | 15.0 | 0.8 | 170 | 214,200 | 25.5 | 10 | 186 | 1.34 | 60 | 71PI3150(1)H6(2) | R71PI3150(1)H6(2) |
| 630 | 220 | 0.22 | 5.0 | 11.0 | 18.0 | 15.0 | 0.8 | 170 | 214,200 | 37.4 | 10 | 127 | 1.62 | 60 | 71PI3220(1)H6(2) | R71PI3220(1)H6(2) |
| 630 | 220 | 0.33 | 6.0 | 12.0 | 18.0 | 15.0 | 0.8 | 170 | 214,200 | 56.1 | 10 | 84 | 2.06 | 56 | 71PI3330(1)H6(2) | R71PI3330(1)H6(2) |
| 630 | 220 | 0.47 | 7.5 | 13.5 | 18.0 | 15.0 | 0.8 | 170 | 214,200 | 79.9 | 10 | 59 | 2.58 | 51 | 71PI3470(1)H6(2) | R71PI3470(1)H6(2) |
| 630 | 220 | 0.68 | 8.5 | 14.5 | 18.0 | 15.0 | 0.8 | 170 | 214,200 | 115.6 | 10 | 53 | 2.82 | 48 | 71PI3680(1)H6(2) | R71PI3680(1)H6(2) |
| 630 | 220 | 1.0 | 11.0 | 19.0 | 18.0 | 15.0 | 0.8 | 170 | 214,200 | 170.0 | 10 | 36 | 3.73 | 40 | 71PI4100(1)H6(2) | R71PI4100(1)H6(2) |
| 630 | 220 | 1.5 | 11.0 | 19.0 | 18.0 | 15.0 | 0.8 | 170 | 214,200 | 255.0 | 10 | 27 | 4.33 | 40 | 71PI4150(1)H6(4) | R71PI4150(1)H6(4) |
| 630 | 220 | 0.68 | 6.0 | 15.0 | 26.5 | 22.5 | 0.8 | 110 | 138,600 | 74.8 | 16 | 75 | 2.48 | 43 | 71PN3680(1)H6(2) | R71PN3680(1)H6(2) |
| 630 | 220 | 1.0 | 8.5 | 17.0 | 26.5 | 22.5 | 0.8 | 110 | 138,600 | 110.0 | 16 | 51 | 3.20 | 38 | 71PN4100(1)H6(2) | R71PN4100(1)H6(2) |
| 630 | 220 | 1.5 | 10.0 | 18.5 | 26.5 | 22.5 | 0.8 | 110 | 138,600 | 165.0 | 16 | 34 | 4.06 | 36 | 71PN4150(1)H6(2) | R71PN4150(1)H6(2) |
| 630 | 220 | 2.2 | 11.0 | 20.0 | 26.5 | 22.5 | 0.8 | 110 | 138,600 | 242.0 | 16 | 23 | 5.04 | 34 | 71PN4220(1)H6(2) | R71PN4220(1)H6(2) |
| 630 | 220 | 3.3 | 13.0 | 22.0 | 26.5 | 22.5 | 0.8 | 110 | 138,600 | 363.0 | 16 | 15 | 6.43 | 31 | 71PN4330(1)H6(2) | R71PN4330(1)H6(2) |
| 630 | 220 | 1.5 | 9.0 | 17.0 | 32.0 | 27.5 | 0.8 | 80 | 100,800 | 120.0 | 18 | 42 | 3.67 | 35 | 71PR4150(1)H6(2) | R71PR4150(1)H6(2) |
| 630 | 220 | 2.2 | 11.0 | 20.0 | 32.0 | 27.5 | 0.8 | 80 | 100,800 | 176.0 | 18 | 29 | 4.69 | 31 | 71PR4220(1)H6(2) | R71PR4220(1)H6(2) |
| 630 | 220 | 3.3 | 13.0 | 22.0 | 32.0 | 27.5 | 0.8 | 80 | 100,800 | 264.0 | 18 | 19 | 5.97 | 29 | 71PR4330(1)H6(2) | R71PR4330(1)H6(2) |
| 630 | 220 | 4.7 | 13.0 | 25.0 | 32.0 | 27.5 | 0.8 | 80 | 100,800 | 376.0 | 18 | 14 | 7.30 | 28 | 71PR4470(1)H6(4) | R71PR4470(1)H6(4) |
| 630 | 220 | 6.8 | 16.0 | 30.0 | 32.0 | 27.5 | 0.8 | 80 | 100,800 | 544.0 | 18 | 9 | 9.33 | 25 | 71PR4680(1)H6(2) | R71PR4680(1)H6(2) |
| 630 | 220 | 10 | 22.0 | 37.0 | 32.0 | 27.5 | 0.8 | 80 | 100,800 | 800.0 | 18 | 10 | 9.73 | 21 | 71PR5100(1)H6(2) | R71PR5100(1)H6(2) |

| VDC | VAC | Cap Value | T | H | L | Lead Spacing (S) | Ød (mm) | dV/dt (V/µs) | Max $K_0$ ($V^2$/µs) | $A_{pk}$ | Lead Length | at 100 kHz | at 100 kHz, 85°C | (°C/W) | KEMET Part Number | Customer Part Number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | $I_{pkr}$ | ESL | ESR | $I_{rms}$ max (*) | $R_{th}$ | | |

*(1) Insert lead and packaging code. See table for available options.*
*(2) J=5%, K = 10%, M = 20%*
*(3) M = ±20% (only available tolerance)*
*(4) K = 10%, M = ±20% (only available tolerance)*

## Soldering Process

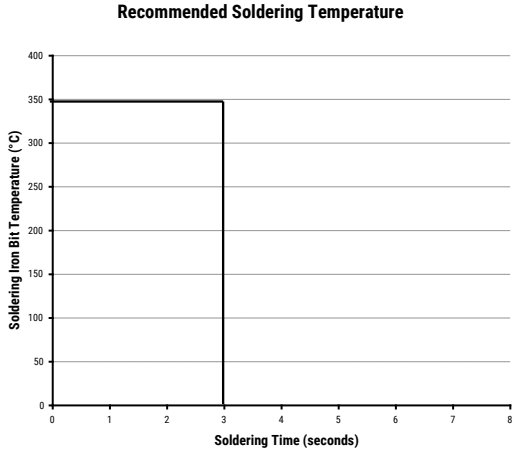
The implementation of the RoHS directive has resulted in the selection of SnAgCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183°C for SnPb eutectic alloy to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even 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 mm to 15 mm), and great care has to be taken during soldering. The recommended solder profiles from KEMET should be used. Please 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. Please see Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above 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 the curing of 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 two soldering cycles is recommended. Please allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

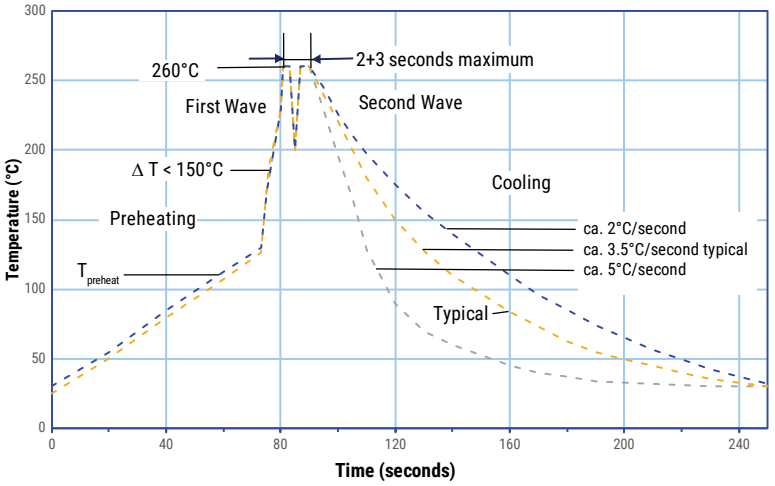
### Manual Soldering Recommendations

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




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.

**Wave Soldering Recommendations cont.**

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

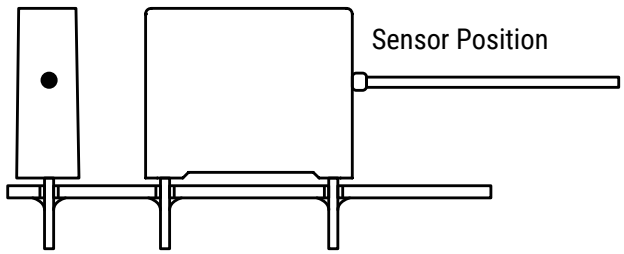
**Figure 1**

| Film Material | Maximum Preheat Temperature | | Maximum Peak Soldering Temperature | |
|---|---|---|---|---|
| | Capacitor Pitch ≤ 15 mm | Capacitor Pitch > 15 mm | Capacitor Pitch ≤ 15 mm | Capacitor Pitch > 15 mm |
| Single Metallized HT Polypropylene | 125°C | 130°C | 260°C | 270°C |

2. The maximum temperature measured on the capacitor body:
   Set the temperature so that the maximum temperature is below the limit:

| Film Material | Maximum Temperature Measured on the Capacitor Body |
|---|---|
| Single Metallized Polypropylene | 120°C (for series R71H) |

*Duration: < 60 seconds*




**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 and 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 bath with a time from 3 to 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 are not overheated.

## Mounting

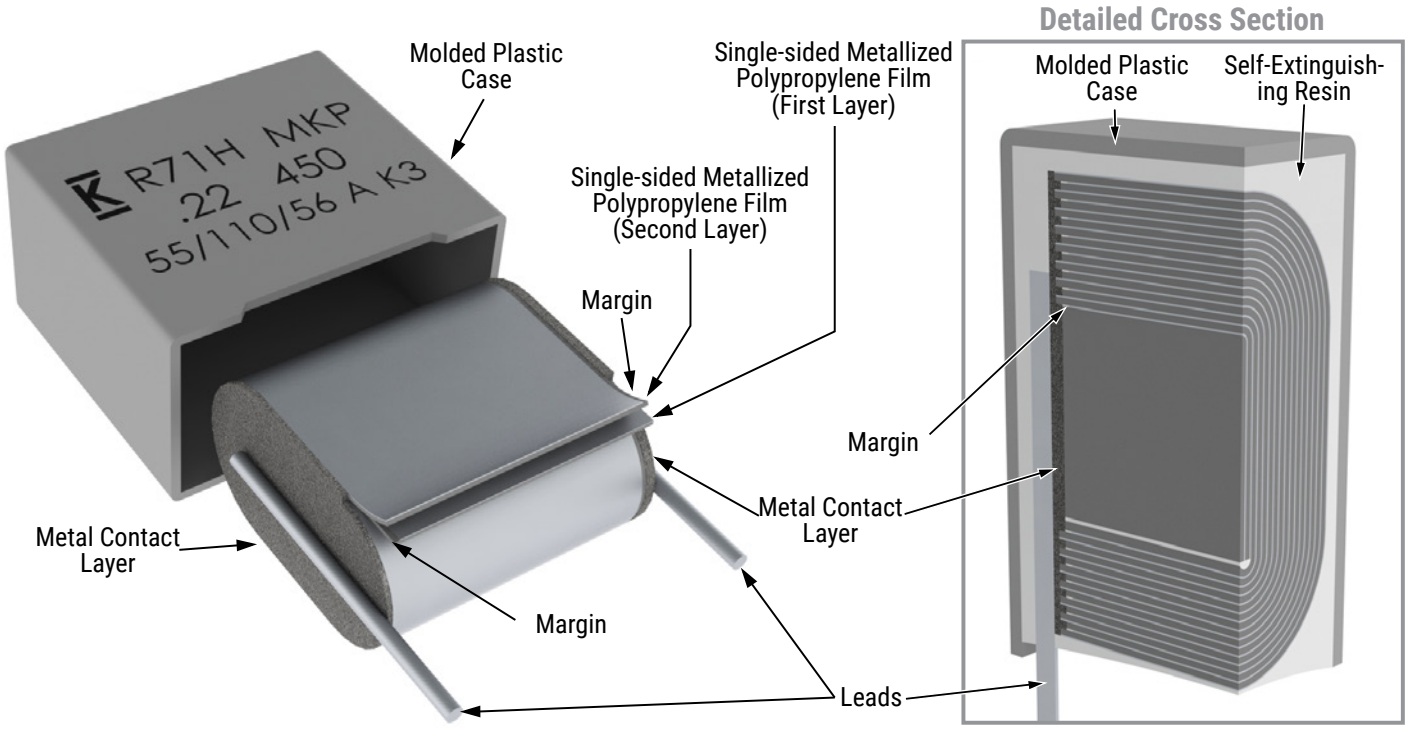
### Resistance to Vibration and Mechanical Shock

AEC-Q200 Mechanical Stress Tests:

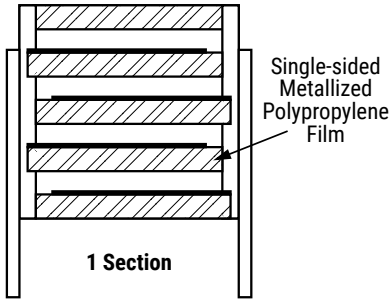
| | | |
|---|---|---|
| **Mechanical Shock** | **MIL-SDT-202 Method 213** | Test condition C<br>Peak value 100 g, duration 6 ms, half-sine-wave (see MIL-HDBK for details) |
| **Vibration** | **MIL-SDT-202 Method 204** | 5 g for 20 minutes, 12 cycles each of 3 orientations<br>Use 8"X5" PCB, 0.031" thick. 7 secure points on one 8" side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10 – 2,000 Hz. |

The capacitors are designed for PCB mounting. The stand-off pipes must be in good contact with the printed circuit board. The capacitors with pitch ≤ 22.5 mm can be mechanically fixed by the leads, for pitch > 22.5 mm, the capacitor body has to be properly fixed (e.g. clamped or glued).

## Construction

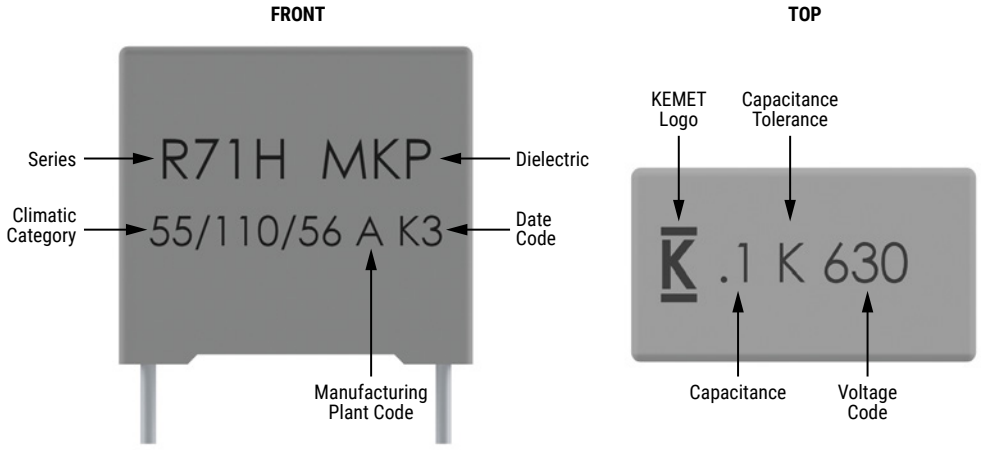



### Winding Scheme

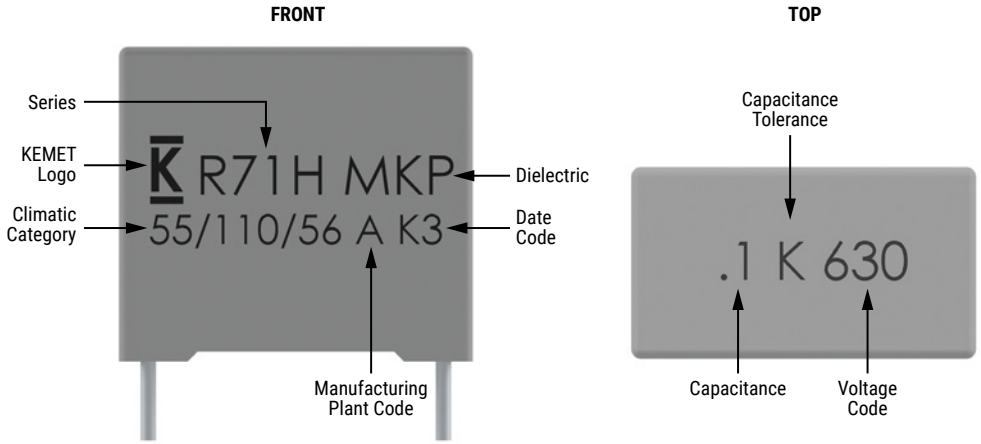


## Marking

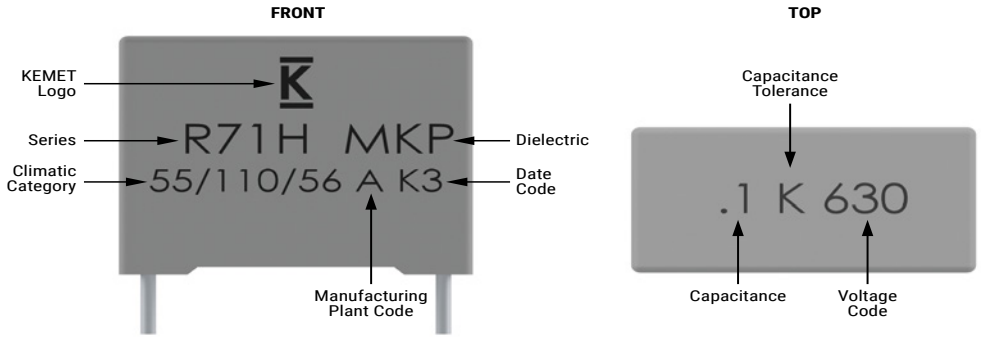
### Pitch – 10, 15 & 22.5




### Pitch – 10, 15 & 22.5 Alternatives*




### Pitch – 10, 15 & 22.5 Alternatives*

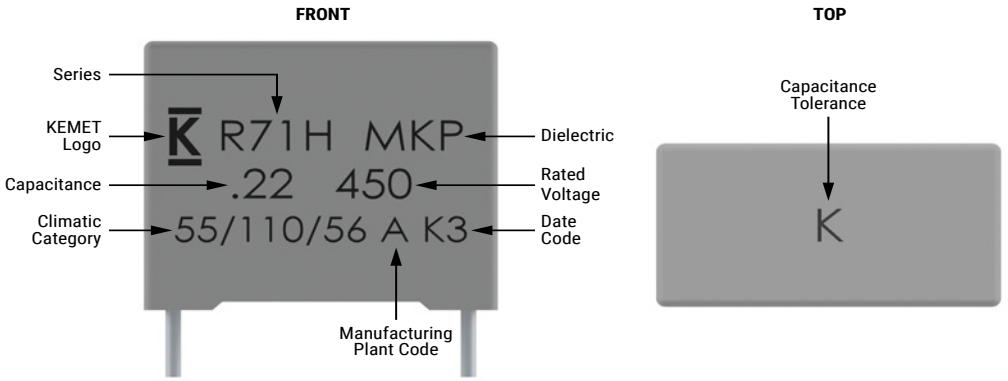



** Differences are caused by technology (clichee, laser or ink jet) and technic (production line).*

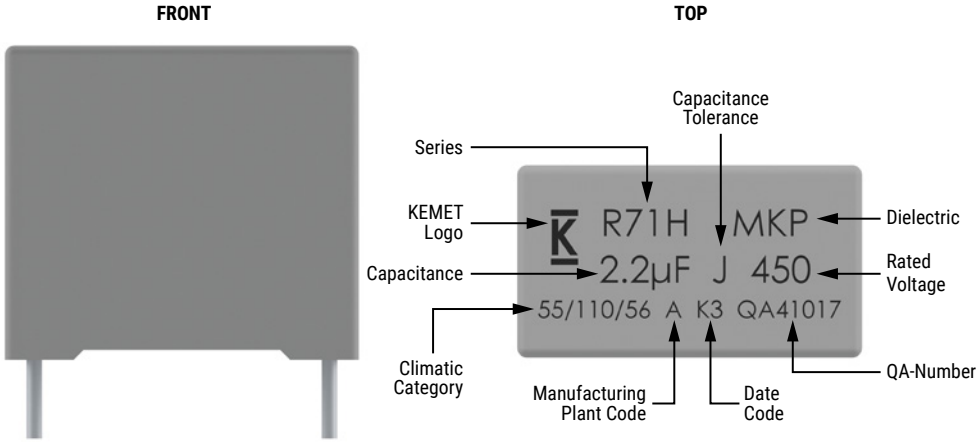
*Slight change in the layout can be possible but this does not affect the content of the information of the current marking.*
*This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics.*

## Marking cont.

### Pitch – 10, 15, 22.5 Alternatives* & 27.5




### Pitch – 27.5 Alternatives*




** Differences are caused by technology (clichee, laser, or ink) and technic (production line)*

*Slight change in the layout can be possible but this does not affect the content of the information of the current marking.*
*This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics.*

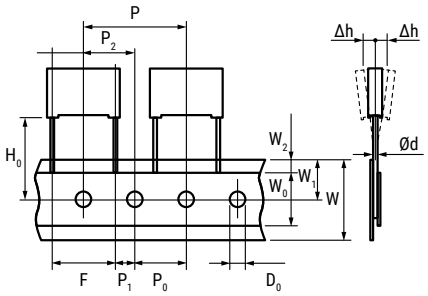
| Manufacturing Date Code (IEC–60062) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Year | Code | Year | Code | Year | Code | Month | Code | Month | Code |
| 2020 | M | 2027 | V | 2034 | E | January | 1 | July | 7 |
| 2021 | N | 2028 | W | 2035 | F | February | 2 | August | 8 |
| 2022 | P | 2029 | X | 2036 | H | March | 3 | September | 9 |
| 2023 | R | 2030 | A | 2037 | J | April | 4 | October | O |
| 2024 | S | 2031 | B | 2038 | K | May | 5 | November | N |
| 2025 | T | 2032 | C | 2039 | L | June | 6 | December | D |
| 2026 | U | 2033 | D | 2040 | M | – | – | – | – |

## Packaging Quantities

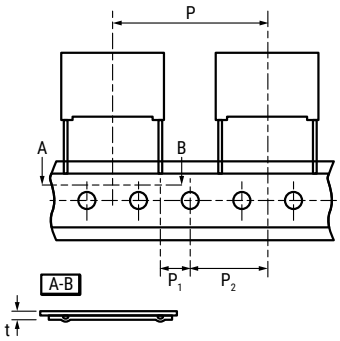
| Lead Spacing | Thickness (mm) | Height (mm) | Length (mm) | Bulk Short Leads | Bulk Long Leads | | Standard Reel ø 355 mm | Large Reel ø 500 mm | Ammo Taped |
|---|---|---|---|---|---|---|---|---|---|
| | Lead and Packaging Code | | | AA – JB<br>JE – JH | JM | 40 – 50 | GY | CK | DQ |
| 10 | 4.0 | 9.0 | 13.0 | 2,000 | 2,200 | 1,800 | 750 | 1,500 | 1,000 |
| | 5.0 | 11.0 | 13.0 | 1,300 | 2,000 | 1,500 | 600 | 1,250 | 800 |
| | 6.0 | 12.0 | 13.0 | 1,000 | 1,800 | 1,200 | 500 | 1,000 | 680 |
| 15 | 5.0 | 11.0 | 18.0 | 2,000 | 1,250 | 1,000 | 600 | 1,250 | 800 |
| | 6.0 | 12.0 | 18.0 | 1,750 | 1,000 | 900 | 500 | 1,000 | 680 |
| | 6.0 | 17.5 | 18.0 | 1,000 | 800 | 700 | 500 | 1,000 | 680 |
| | 7.5 | 13.5 | 18.0 | 1,000 | 800 | 700 | 350 | 800 | 500 |
| | 7.5 | 18.5 | 18.0 | 900 | 650 | 500 | 350 | 800 | 500 |
| | 8.5 | 14.5 | 18.0 | 1,000 | 650 | 500 | 300 | 700 | 440 |
| | 9.0 | 12.5 | 18.0 | 1,000 | 700 | 520 | 270 | 650 | 410 |
| | 10.0 | 16.0 | 18.0 | 750 | 550 | 500 | 270 | 600 | 380 |
| | 11.0 | 19.0 | 18.0 | 450 | 400 | 350 | 270 | 500 | 340 |
| | 13.0 | 12.0 | 18.0 | 750 | 520 | 490 | 200 | 480 | 280 |
| 22.5 | 6.0 | 15.0 | 26.5 | 805 | 450 | 500 | 300 | 700 | 464 |
| | 7.0 | 16.0 | 26.5 | 700 | 450 | 500 | 250 | 550 | 380 |
| | 8.5 | 17.0 | 26.5 | 468 | 350 | 300 | 250 | 450 | 280 |
| | 10.0 | 18.5 | 26.5 | 396 | 350 | 300 | 160 | 350 | 235 |
| | 11.0 | 20.0 | 26.5 | 360 | 200 | 250 | 160 | 350 | 217 |
| | 13.0 | 22.0 | 26.5 | 300 | 150 | 200 | 130 | 300 | - |
| 27.5 | 9.0 | 17.0 | 32.0 | 816 | - | 408 | 230 | 450 | - |
| | 11.0 | 20.0 | 32.0 | 560 | - | 336 | 190 | 350 | - |
| | 13.0 | 12.0 | 32.0 | 672 | - | 288 | - | - | - |
| | 13.0 | 22.0 | 32.0 | 480 | - | 288 | 150 | 300 | - |
| | 13.0 | 25.0 | 32.0 | 480 | - | 288 | - | - | - |
| | 14.0 | 28.0 | 32.0 | 352 | - | 176 | - | - | - |
| | 16.0 | 30.0 | 32.0 | 288 | - | 144 | - | - | - |
| | 18.0 | 33.0 | 32.0 | 256 | - | 128 | - | - | - |
| | 22.0 | 37.0 | 32.0 | 168 | - | 112 | - | - | - |
| | 24.0 | 15.0 | 32.0 | 336 | - | 144 | - | - | - |

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

**Lead Spacing 10 & 15 mm**




**Lead Spacing 22.5 & 27.5 mm**




## Taping Specification

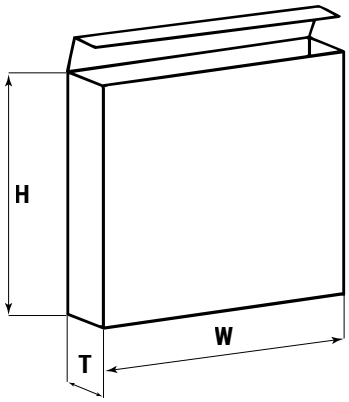
| Description | Symbol | Dimensions (mm) | | | | |
|---|---|---|---|---|---|---|
| | | Lead Spacing | | | | Tolerance |
| | | 10.0 | 15.0 | 22.5 | 27.5 | |
| Lead wire diameter | d | 0.6 | 0.6 – 0.8 | 0.8 | 0.8 | ±0.05 |
| Taping lead space | P | 25.4 | 25.4 | 38.1 | 38.1 | ±1 |
| Feed hole lead space * | $P_0$ | 12.7 | 12.7 | 12.7 | 12.7 | ±0.2 ** |
| Centering of the lead wire | $P_1$ | 7.7 | 5.2 | 7.8 | 5.3 | ±0.7 |
| Centering of the body | $P_2$ | 12.7 | 12.7 | 19.05 | 19.05 | ±1.3 |
| Lead spacing *** | F | 10.0 | 15.0 | 22.5 | 27.5 | +0.6/−0.1 |
| Component alignment | Δh | 0 | 0 | 0 | 0 | ±2 |
| Component deviation | Δp | 0 | 0 | 0 | 0 | ±1 |
| Height of component from tape center | $H_0$**** | 18.5 | 18.5 | 18.5 | 18.5 | ±0.5 |
| Carrier tape width | W | 18 | 18 | 18 | 18 | +1/−0.5 |
| Hold down tape width | $W_0$ | 9 | 10 | 10 | 10 | Minimum |
| Hole position | $W_1$ | 9 | 9 | 9 | 9 | ±0.5 |
| Hold down tape position | $W_2$ | 3 | 3 | 3 | 3 | Maximum |
| Feed hole diameter | $D_0$ | 4 | 4 | 4 | 4 | ±0.2 |
| Total tape thickness | t | 0.7 | 0.7 | 0.7 | 0.7 | ±0.2 |

** Available also 15 mm.*
*** Maximum 1 mm on 20 lead spacing.*
**** 15 mm and 10 mm taped to 7.5 mm (crimped leads) available upon request.*
***** $H_0$ = 16.5 mm is available upon request.*

# Lead Taping & Packaging (IEC 60286–2) cont.

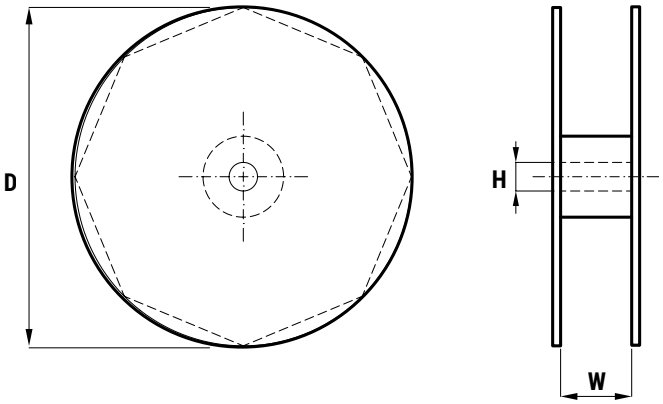
## Ammo Specifications

| Dimensions (mm) | | |
|---|---|---|
| H | W | T |
| 360 | 340 | 59 |




## Reel Specifications

| Dimensions (mm) | | |
|---|---|---|
| D | H | W |
| 355<br>500 | 30<br>25 | 55 Maximum |



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