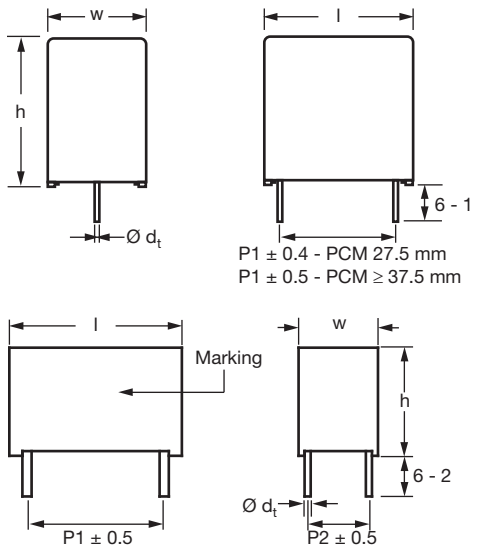
# Metallized Polypropylene Film Capacitor
# AC Capacitor MKP Type




Ø $d_t$ ± 10 % of standard diameter specified

## APPLICATIONS
High performance AC filtering applications

## REFERENCE STANDARDS
IEC 61071
IEC 60068

## MARKING
C-value; tolerance; rated voltage; code for dielectric material; code for manufacturing origin; manufacturer's type designation; manufacturer's logo; year and week of manufacture

## DIELECTRIC
Polypropylene film

## ELECTRODES
Metallized dielectric film

## CONSTRUCTION
Mono construction

## ENCAPSULATION
Plastic case sealed with resin.
Flame retardant

## TERMINALS
Tinned wires

## FEATURES
- Compliant to RoHS Directive 2002/95/EC

Pb-free
e3
RoHS COMPLIANT

## RATED CAPACITANCE
1 µF to 70 µF

## CAPACITANCE TOLERANCE
± 5 % and 10 %

## AC VOLTAGE RATING ($V_{RMS}$)

| $U_N$ | AC VOLTAGE AT 85 °C | AC VOLTAGE AT 105 °C |
|---|---|---|
| 230 V | 230 V | 160 V |
| 250 V | 250 V | 175 V |
| 275 V | 275 V | 190 V |
| 310 V | 310 V | 210 V |
| 350 V | 350 V | 240 V |
| 440 V | 440 V | 300 V |

## INSULATION RESISTANCE
RC between leads, after 1 min > 10 000 s
Measuring voltage 500 V

## SELF INDUCTANCE (Ls)
< 1 nH per mm of lead spacing

## WITHSTANDING DC VOLTAGE BETWEEN TERMINALS
1.5 $U_{NDC}$ for 10 s, cut off current 10 mA, rise time ≤ 1000 V/s
See document "Voltage Test for Metalized Capacitors" www.vishay.com/doc?28169

## CLIMATIC TESTING CLASS
40/85/56

## MAXIMUM APPLICATION TEMPERATURE
105 °C

## MAXIMUM OPERATING TEMPERATURE (CASE)
105 °C

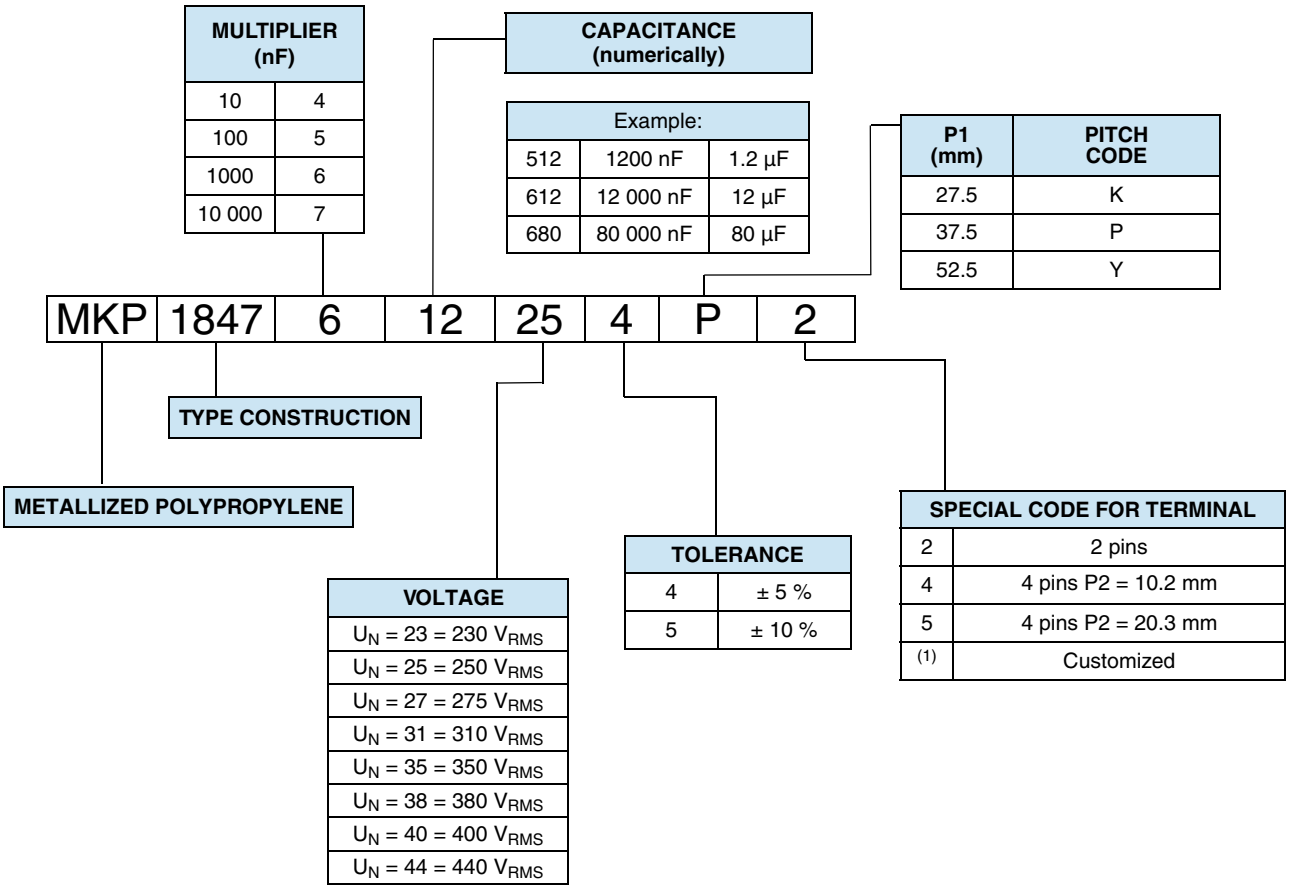
## LIFETIME EXPECTANCY
Useful lifetime expectancy: > 60 000 h at $U_N$

FIT: < 10 x $10^{-9}$/h (10 per $10^9$ component hours) at 0.5 x $U_N$
40 °C

## DETAILED SPECIFICATION
For more detailed data and test requirements contact: dc-film@vishay.com

## GENERAL INFORMATION
Characteristics and definitions used for film capacitors
www.vishay.com/docs?28147/intro.pdf

## COMPOSITION OF CATALOG NUMBER




**Note**
(1) Tabs terminals or customized terminals are available on request

## SPECIFIC REFERENCE DATA 230 $V_{RMS}$

**$U_N$ = 230 $V_{AC}$, $U_{NDC}$ = 450 V**

| CAP. (1) | DIMENSIONS (2) (mm) | | | P1 | P2 | Ø $d_t$ | dU/dt (3) | $I_{PEAK}$ | $I_{RMS}$ (4) (A) | | tan δ (5) 1 kHz < ($10^{-4}$) | | tan δ (5) 10 kHz < ($10^{-4}$) | | MASS | SPQ (6) | PART NUMBER (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (µF) | w | h | l | (mm) | (mm) | (mm) | (V/µs) | (A) | 2 pins | 4 pins | 2 pins | 4 pins | 2 pins | 4 pins | ≈ (g) | (pcs) | |
| 1 | 9.0 | 19.0 | 32.0 | 27.5 | - | 0.8 | 45 | 45 | 2.5 | | 4.5 | - | 30 | - | 6 | 160 | MKP1847510234K2 |
| 2 | 11.0 | 21.0 | 32.0 | 27.5 | - | 0.8 | 45 | 90 | 3.5 | | 4.5 | - | 30 | - | 9 | 130 | MKP1847520234K2 |
| 3 | 13.0 | 23.0 | 32.0 | 27.5 | - | 0.8 | 45 | 135 | 5.0 | | 4.5 | - | 30 | - | 11 | 115 | MKP1847530234K2 |
| 4 | 15.0 | 25.0 | 32.0 | 27.5 | - | 0.8 | 45 | 180 | 6.0 | | 4.5 | - | 30 | - | 12 | 100 | MKP1847540234K2 |
| 5 | 18.0 | 28.0 | 32.0 | 27.5 | - | 0.8 | 45 | 225 | 7.5 | | 4.5 | - | 30 | - | 17 | 80 | MKP1847550234K2 |
| 6 | 18.0 | 28.0 | 32.0 | 27.5 | - | 0.8 | 45 | 270 | 8.0 | | 4.5 | - | 30 | - | 16 | 80 | MKP1847560234K2 |
| 7 | 18.0 | 28.0 | 32.0 | 27.5 | - | 0.8 | 45 | 315 | 8.5 | | 4.5 | - | 30 | - | 15 | 80 | MKP1847570234K2 |
| 8 | 21.0 | 31.0 | 32.0 | 27.5 | - | 0.8 | 45 | 360 | 10.0 | | 4.5 | - | 30 | - | 22 | 65 | MKP1847580234K2 |
| 9 | 21.0 | 31.0 | 32.0 | 27.5 | - | 0.8 | 45 | 405 | 10.5 | | 4.5 | - | 30 | - | 21 | 65 | MKP1847590234K2 |
| 10 | 20.0 | 35.0 | 32.0 | 27.5 | - | 0.8 | 45 | 450 | 11.5 | | 4.5 | - | 30 | - | 21 | 70 | MKP1847610234K2 |
| 10 | 18.5 | 35.5 | 43.0 | 37.5 | 10.2 | 1.0 | 20 | 200 | 8.0 | 9.0 | 10 | 8.5 | 75 | 68 | 32 | 105 | MKP1847610234P* |
| 12 | 18.5 | 35.5 | 43.0 | 37.5 | 10.2 | 1.0 | 20 | 240 | 9.0 | 10.0 | 10 | 8.5 | 75 | 68 | 30 | 105 | MKP1847612234P* |
| 15 | 21.5 | 38.5 | 43.0 | 37.5 | 10.2 | 1.0 | 20 | 300 | 11.0 | 12.0 | 10 | 8.5 | 75 | 68 | 37 | 91 | MKP1847615234P* |
| 20 | 24.0 | 44.0 | 42.0 | 37.5 | 10.2 | 1.0 | 20 | 400 | 13.5 | 14.5 | 10 | 8.5 | 75 | 68 | 48 | 77 | MKP1847620234P* |
| 22 | 24.0 | 44.0 | 42.0 | 37.5 | 10.2 | 1.0 | 20 | 440 | 14.0 | 15.5 | 10 | 8.5 | 75 | 68 | 45 | 77 | MKP1847622234P* |
| 25 | 30.0 | 45.0 | 42.0 | 37.5 | 10.2/ 20.3 | 1.0 | 20 | 500 | 16.0 | 17.5 | 10 | 8.5 | 75 | 68 | 62 | 63 | MKP1847625234P* |
| 30 | 30.0 | 45.0 | 42.0 | 37.5 | 10.2/ 20.3 | 1.0 | 20 | 600 | 17.5 | 19.0 | 10 | 8.5 | 75 | 68 | 56 | 63 | MKP1847630234P* |
| 30 | 25.0 | 45.0 | 57.5 | 52.5 | 10.2 | 1.2 | 10 | 300 | 13.5 | 15.0 | 20 | 17 | 150 | 135 | 69 | 55 | MKP1847630234Y* |
| 35 | 25.0 | 45.0 | 57.5 | 52.5 | 10.2 | 1.2 | 10 | 350 | 14.5 | 16.0 | 20 | 17 | 150 | 135 | 65 | 55 | MKP1847635234Y* |
| 40 | 30.0 | 45.0 | 57.5 | 52.5 | 20.3 | 1.2 | 10 | 400 | 16.5 | 18.0 | 20 | 17 | 150 | 135 | 91 | 45 | MKP1847640234Y* |
| 45 | 30.0 | 45.0 | 57.5 | 52.5 | 20.3 | 1.2 | 10 | 450 | 17.5 | 19.0 | 20 | 17 | 150 | 135 | 86 | 45 | MKP1847645234Y* |
| 50 | 35.0 | 50.0 | 57.5 | 52.5 | 20.3 | 1.2 | 10 | 500 | 20.0 | 21.5 | 20 | 17 | 150 | 135 | 107 | 40 | MKP1847650234Y* |
| 55 | 35.0 | 50.0 | 57.5 | 52.5 | 20.3 | 1.2 | 10 | 550 | 21.0 | 22.5 | 20 | 17 | 150 | 135 | 101 | 40 | MKP1847655234Y* |
| 60 | 35.0 | 50.0 | 57.5 | 52.5 | 20.3 | 1.2 | 10 | 600 | 21.5 | 23.5 | 20 | 17 | 150 | 135 | 96 | 40 | MKP1847660234Y* |
| 65 | 45.0 | 45.0 | 57.5 | 52.5 | 20.3 | 1.2 | 10 | 650 | - | 25.5 | - | 17 | - | 135 | 121 | 30 | MKP1847665234Y5 |
| 70 | 45.0 | 45.0 | 57.5 | 52.5 | 20.3 | 1.2 | 10 | 700 | - | 26.0 | - | 17 | - | 135 | 120 | 30 | MKP1847670235Y5 |

**Notes**

(1) Intermediate capacitance values are available on request
(2) Standard dimension
(3) Rated voltage pulse slope (dU/dt) R at voltage $U_{NDC}$
(4) Maximum RMS current at 10 kHz, + 85 °C, Capacitance tolerance specified
(5) The ESR (Equivalent Series Resistance) can be calculated as tan δ (f)/(2 x π x f x C)
(6) SPQ = Standard Packing Quantity
(7) Change the * symbols with special code for terminals

## SPECIFIC REFERENCE DATA 250 $V_{RMS}$

**$U_N$ = 250 $V_{AC}$, $U_{NDC}$ = 500 V**

| CAP. (1) | DIMENSIONS (2) (mm) | | | P1 | P2 | Ø $d_t$ | dU/dt (3) | $I_{PEAK}$ | $I_{RMS}$ (4) (A) | | tan δ (5) 1 kHz < ($10^{-4}$) | | tan δ (5) 10 kHz < ($10^{-4}$) | | MASS | SPQ (6) | PART NUMBER (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (µF) | w | h | l | (mm) | (mm) | (mm) | (V/µs) | (A) | 2 pins | 4 pins | 2 pins | 4 pins | 2 pins | 4 pins | ≈ (g) | (pcs) | |
| 1 | 9.0 | 19.0 | 32.0 | 27.5 | - | 0.8 | 50 | 50 | 3.5 | - | 4 | - | 28 | - | 6 | 160 | MKP1847510254K2 |
| 2 | 11.0 | 21.0 | 32.0 | 27.5 | - | 0.8 | 50 | 100 | 4.5 | - | 4 | - | 28 | - | 9 | 130 | MKP1847520254K2 |
| 3 | 13.0 | 23.0 | 32.0 | 27.5 | - | 0.8 | 50 | 150 | 6.0 | - | 4 | - | 28 | - | 10 | 115 | MKP1847530254K2 |
| 4 | 15.0 | 25.0 | 32.0 | 27.5 | - | 0.8 | 50 | 200 | 7.0 | - | 4 | - | 28 | - | 12 | 100 | MKP1847540254K2 |
| 5 | 18.0 | 28.0 | 32.0 | 27.5 | - | 0.8 | 50 | 250 | 9.0 | - | 4 | - | 28 | - | 16 | 80 | MKP1847550254K2 |
| 6 | 18.0 | 28.0 | 32.0 | 27.5 | - | 0.8 | 50 | 300 | 9.5 | - | 4 | - | 28 | - | 15 | 80 | MKP1847560254K2 |
| 7 | 21.0 | 31.0 | 32.0 | 27.5 | - | 0.8 | 50 | 350 | 11.0 | - | 4 | - | 28 | - | 22 | 65 | MKP1847570254K2 |
| 8 | 21.0 | 31.0 | 32.0 | 27.5 | - | 0.8 | 50 | 400 | 12.0 | - | 4 | - | 28 | - | 21 | 65 | MKP1847580254K2 |
| 9 | 20.0 | 35.0 | 32.0 | 27.5 | - | 0.8 | 50 | 450 | 13.0 | - | 4 | - | 28 | - | 20 | 70 | MKP1847590254K2 |
| 5 | 18.5 | 35.5 | 43.0 | 37.5 | 10.2 | 1.0 | 25 | 125 | 7.0 | 8.0 | 8.5 | 7 | 70 | 65 | 36 | 105 | MKP1847550254P* |
| 6 | 18.5 | 35.5 | 43.0 | 37.5 | 10.2 | 1.0 | 25 | 150 | 7.5 | 8.5 | 8.5 | 7 | 70 | 65 | 35 | 105 | MKP1847560254P* |
| 7 | 18.5 | 35.5 | 43.0 | 37.5 | 10.2 | 1.0 | 25 | 175 | 8.0 | 9.0 | 8.5 | 7 | 70 | 65 | 34 | 105 | MKP1847570254P* |
| 8 | 18.5 | 35.5 | 43.0 | 37.5 | 10.2 | 1.0 | 25 | 200 | 9.0 | 10.0 | 8.5 | 7 | 70 | 65 | 32 | 105 | MKP1847580254P* |
| 9 | 18.5 | 35.5 | 43.0 | 37.5 | 10.2 | 1.0 | 25 | 225 | 9.5 | 10.5 | 8.5 | 7 | 70 | 65 | 31 | 105 | MKP1847590254P* |
| 10 | 18.5 | 35.5 | 43.0 | 37.5 | 10.2 | 1.0 | 25 | 250 | 10.0 | 11.0 | 8.5 | 7 | 70 | 65 | 30 | 105 | MKP1847610254P* |
| 12 | 18.5 | 35.5 | 43.0 | 37.5 | 10.2 | 1.0 | 25 | 300 | 11.0 | 12.0 | 8.5 | 7 | 70 | 65 | 27 | 105 | MKP1847612254P* |
| 15 | 21.5 | 38.5 | 43.0 | 37.5 | 10.2 | 1.0 | 25 | 375 | 13.0 | 14.0 | 8.5 | 7 | 70 | 65 | 34 | 91 | MKP1847615254P* |
| 20 | 30.0 | 45.0 | 42.0 | 37.5 | 10.2/ 20.3 | 1.0 | 25 | 500 | 17.0 | 18.5 | 8.5 | 7 | 70 | 65 | 63 | 63 | MKP1847620254P* |
| 22 | 30.0 | 45.0 | 42.0 | 37.5 | 10.2/ 20.3 | 1.0 | 25 | 550 | 18.0 | 19.5 | 8.5 | 7 | 70 | 65 | 61 | 63 | MKP1847622254P* |
| 25 | 30.0 | 45.0 | 42.0 | 37.5 | 10.2/ 20.3 | 1.0 | 25 | 625 | 19.0 | 21.0 | 8.5 | 7 | 70 | 65 | 57 | 63 | MKP1847625254P* |
| 15 | 25.0 | 45.0 | 57.5 | 52.5 | 10.2 | 1.2 | 12 | 180 | 11.5 | 12.5 | 16 | 14 | 135 | 125 | 83 | 55 | MKP1847615254Y* |
| 20 | 25.0 | 45.0 | 57.5 | 52.5 | 10.2 | 1.2 | 12 | 240 | 13.5 | 14.5 | 16 | 14 | 135 | 125 | 77 | 55 | MKP1847620254Y* |
| 22 | 25.0 | 45.0 | 57.5 | 52.5 | 10.2 | 1.2 | 12 | 264 | 14.0 | 15.5 | 16 | 14 | 135 | 125 | 75 | 55 | MKP1847622254Y* |
| 25 | 25.0 | 45.0 | 57.5 | 52.5 | 10.2 | 1.2 | 12 | 300 | 15.0 | 16.5 | 16 | 14 | 135 | 125 | 71 | 55 | MKP1847625254Y* |
| 30 | 30.0 | 45.0 | 57.5 | 52.5 | 20.3 | 1.2 | 12 | 360 | 17.0 | 18.5 | 16 | 14 | 135 | 125 | 97 | 45 | MKP1847630254Y* |
| 35 | 30.0 | 45.0 | 57.5 | 52.5 | 20.3 | 1.2 | 12 | 420 | 18.5 | 20.0 | 16 | 14 | 135 | 125 | 91 | 45 | MKP1847635254Y* |
| 40 | 35.0 | 50.0 | 57.5 | 52.5 | 20.3 | 1.2 | 12 | 480 | 21.5 | 23.0 | 16 | 14 | 135 | 125 | 111 | 40 | MKP1847640254Y* |
| 45 | 35.0 | 50.0 | 57.5 | 52.5 | 20.3 | 1.2 | 12 | 540 | 22.5 | 24.5 | 16 | 14 | 135 | 125 | 105 | 40 | MKP1847645254Y* |
| 50 | 35.0 | 50.0 | 57.5 | 52.5 | 20.3 | 1.2 | 12 | 600 | 23.5 | 26.0 | 16 | 14 | 135 | 125 | 98 | 40 | MKP1847650254Y* |
| 55 | 45.0 | 45.0 | 57.5 | 52.5 | 20.3 | 1.2 | 12 | 660 | - | 28.5 | - | 14 | - | 125 | 123 | 30 | MKP1847655254Y5 |
| 60 | 45.0 | 45.0 | 57.5 | 52.5 | 20.3 | 1.2 | 12 | 720 | - | 29.0 | - | 14 | - | 125 | 120 | 30 | MKP1847660255Y5 |

**Notes**

(1) Intermediate capacitance values are available on request
(2) Standard dimension
(3) Rated voltage pulse slope (dU/dt) R at voltage $U_{NDC}$
(4) Maximum RMS current at 10 kHz, + 85 °C, Capacitance tolerance specified
(5) The ESR (Equivalent Series Resistance) can be calculated as tan δ (f)/(2 x π x f x C)
(6) SPQ = Standard Packing Quantity
(7) Change the * symbols with special code for terminals

## SPECIFIC REFERENCE DATA 275 $V_{RMS}$

**$U_N$ = 275 $V_{AC}$, $U_{NDC}$ = 600 V**

| CAP. (1) | DIMENSIONS (2) (mm) | | | P1 | P2 | Ø $d_t$ | dU/dt (3) | $I_{PEAK}$ | $I_{RMS}$ (4) (A) | | tan δ (5) 1 kHz < ($10^{-4}$) | | tan δ (5) 10 kHz < ($10^{-4}$) | | MASS | SPQ (6) | PART NUMBER (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (µF) | w | h | l | (mm) | (mm) | (mm) | (V/µs) | (A) | 2 pins | 4 pins | 2 pins | 4 pins | 2 pins | 4 pins | ≈ (g) | (pcs) | |
| 1 | 9.0 | 19.0 | 32.0 | 27.5 | - | 0.8 | 55 | 55 | 3.5 | - | 4 | - | 25 | - | 6 | 160 | MKP1847510274K2 |
| 2 | 13.0 | 23.0 | 32.0 | 27.5 | - | 0.8 | 55 | 110 | 5.0 | - | 4 | - | 25 | - | 11 | 115 | MKP1847520274K2 |
| 3 | 15.0 | 25.0 | 32.0 | 27.5 | - | 0.8 | 55 | 165 | 6.5 | - | 4 | - | 25 | - | 12 | 100 | MKP1847530274K2 |
| 4 | 18.0 | 28.0 | 32.0 | 27.5 | - | 0.8 | 55 | 220 | 8.5 | - | 4 | - | 25 | - | 16 | 80 | MKP1847540274K2 |
| 5 | 21.0 | 31.0 | 32.0 | 27.5 | - | 0.8 | 55 | 275 | 10.0 | - | 4 | - | 25 | - | 22 | 65 | MKP1847550274K2 |
| 6 | 21.0 | 31.0 | 32.0 | 27.5 | - | 0.8 | 55 | 330 | 11.0 | - | 4 | - | 25 | - | 21 | 65 | MKP1847560274K2 |
| 7 | 20.0 | 35.0 | 32.0 | 27.5 | - | 0.8 | 55 | 385 | 12.0 | - | 4 | - | 25 | - | 20 | 70 | MKP1847570274K2 |
| 5 | 18.5 | 35.5 | 43.0 | 37.5 | 10.2 | 1.0 | 30 | 150 | 7.5 | 8.5 | 7.5 | 6.5 | 65 | 55 | 34 | 105 | MKP1847550274P* |
| 6 | 18.5 | 35.5 | 43.0 | 37.5 | 10.2 | 1.0 | 30 | 180 | 8.0 | 9.0 | 7.5 | 6.5 | 65 | 55 | 33 | 105 | MKP1847560274P* |
| 7 | 18.5 | 35.5 | 43.0 | 37.5 | 10.2 | 1.0 | 30 | 210 | 9.0 | 10.0 | 7.5 | 6.5 | 65 | 55 | 31 | 105 | MKP1847570274P* |
| 8 | 18.5 | 35.5 | 43.0 | 37.5 | 10.2 | 1.0 | 30 | 240 | 9.5 | 10.5 | 7.5 | 6.5 | 65 | 55 | 30 | 105 | MKP1847580274P* |
| 9 | 18.5 | 35.5 | 43.0 | 37.5 | 10.2 | 1.0 | 30 | 270 | 10.0 | 11.0 | 7.5 | 6.5 | 65 | 55 | 28 | 105 | MKP1847590274P* |
| 10 | 21.5 | 38.5 | 43.0 | 37.5 | 10.2 | 1.0 | 30 | 300 | 11.0 | 12.5 | 7.5 | 6.5 | 65 | 55 | 37 | 91 | MKP1847610274P* |
| 12 | 21.5 | 38.5 | 43.0 | 37.5 | 10.2 | 1.0 | 30 | 360 | 12.5 | 13.5 | 7.5 | 6.5 | 65 | 55 | 34 | 91 | MKP1847612274P* |
| 15 | 24.0 | 44.0 | 42.0 | 37.5 | 10.2 | 1.0 | 30 | 450 | 14.5 | 16.0 | 7.5 | 6.5 | 65 | 55 | 45 | 77 | MKP1847615274P* |
| 20 | 30.0 | 45.0 | 42.0 | 37.5 | 10.2 / 20.3 | 1.0 | 30 | 600 | 18.0 | 20.0 | 7.5 | 6.5 | 65 | 55 | 56 | 63 | MKP1847620274P* |
| 15 | 25.0 | 45.0 | 57.5 | 52.5 | 10.2 | 1.2 | 13 | 195 | 12.5 | 13.5 | 14 | 12 | 125 | 105 | 78 | 55 | MKP1847615274Y* |
| 20 | 25.0 | 45.0 | 57.5 | 52.5 | 10.2 | 1.2 | 13 | 260 | 14.0 | 15.5 | 14 | 12 | 125 | 105 | 70 | 55 | MKP1847620274Y* |
| 22 | 25.0 | 45.0 | 57.5 | 52.5 | 10.2 | 1.2 | 13 | 286 | 15.0 | 16.0 | 14 | 12 | 125 | 105 | 67 | 55 | MKP1847622274Y* |
| 25 | 30.0 | 45.0 | 57.5 | 52.5 | 20.3 | 1.2 | 13 | 325 | 16.5 | 18.0 | 14 | 12 | 125 | 105 | 95 | 45 | MKP1847625274Y* |
| 30 | 30.0 | 45.0 | 57.5 | 52.5 | 20.3 | 1.2 | 13 | 390 | 18.0 | 20.0 | 14 | 12 | 125 | 105 | 86 | 45 | MKP1847630274Y* |
| 35 | 35.0 | 50.0 | 57.5 | 52.5 | 20.3 | 1.2 | 13 | 455 | 21.0 | 23.0 | 14 | 12 | 125 | 105 | 106 | 40 | MKP1847635274Y* |
| 40 | 35.0 | 50.0 | 57.5 | 52.5 | 20.3 | 1.2 | 13 | 520 | 22.5 | 24.5 | 14 | 12 | 125 | 105 | 96 | 40 | MKP1847640274Y* |
| 45 | 45.0 | 45.0 | 57.5 | 52.5 | 20.3 | 1.2 | 13 | 585 | - | 27.5 | - | 12 | 125 | 105 | 186 | 30 | MKP1847645274Y5 |
| 50 | 45.0 | 45.0 | 57.5 | 52.5 | 20.3 | 1.2 | 13 | 650 | - | 28.0 | - | 12 | 125 | 105 | 186 | 30 | MKP1847650275Y5 |

**Notes**

(1) Intermediate capacitance values are available on request
(2) Standard dimension
(3) Rated voltage pulse slope (dU/dt) R at voltage $U_{NDC}$
(4) Maximum RMS current at 10 kHz, + 85 °C, Capacitance tolerance specified
(5) The ESR (Equivalent Series Resistance) can be calculated as tan δ (f)/(2 x π x f x C)
(6) SPQ = Standard Packing Quantity
(7) Change the * symbols with special code for terminals

## SPECIFIC REFERENCE DATA 310 $V_{RMS}$

**$U_N$ = 310 $V_{AC}$, $U_{NDC}$ = 630 V**

| CAP. (1) | DIMENSIONS (2) (mm) | | | P1 | P2 | Ø $d_t$ | dU/dt (3) | $I_{PEAK}$ | $I_{RMS}$ (4) (A) | | tan δ (5) 1 kHz < ($10^{-4}$) | | tan δ (5) 10 kHz < ($10^{-4}$) | | MASS | SPQ (6) | PART NUMBER (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (µF) | w | h | l | (mm) | (mm) | (mm) | (V/µs) | (A) | 2 pins | 4 pins | 2 pins | 4 pins | 2 pins | 4 pins | ≈ (g) | (pcs) | |
| 1 | 11.0 | 21.0 | 32.0 | 27.5 | - | 0.8 | 68 | 68 | 4.5 | - | 3.5 | - | 20 | - | 9 | 130 | MKP1847510314K2 |
| 2 | 15.0 | 25.0 | 32.0 | 27.5 | - | 0.8 | 68 | 136 | 7.5 | - | 3.5 | - | 20 | - | 12 | 100 | MKP1847520314K2 |
| 3 | 18.0 | 28.0 | 32.0 | 27.5 | - | 0.8 | 68 | 204 | 9.5 | - | 3.5 | - | 20 | - | 16 | 80 | MKP1847530314K2 |
| 4 | 21.0 | 31.0 | 32.0 | 27.5 | - | 0.8 | 68 | 272 | 12.0 | - | 3.5 | - | 20 | - | 22 | 65 | MKP1847540314K2 |
| 5 | 21.0 | 31.0 | 32.0 | 27.5 | - | 0.8 | 68 | 340 | 13.5 | - | 3.5 | - | 20 | - | 20 | 65 | MKP1847550314K2 |
| 5 | 18.5 | 35.5 | 43.0 | 37.5 | 10.2 | 1.0 | 35 | 175 | 10.0 | 11.0 | 7 | 6 | 55 | 48 | 32 | 105 | MKP1847550314P* |
| 6 | 18.5 | 35.5 | 43.0 | 37.5 | 10.2 | 1.0 | 35 | 210 | 11.0 | 12.0 | 7 | 6 | 55 | 48 | 30 | 105 | MKP1847560314P* |
| 7 | 18.5 | 35.5 | 43.0 | 37.5 | 10.2 | 1.0 | 35 | 245 | 12.0 | 13.0 | 7 | 6 | 55 | 48 | 28 | 105 | MKP1847570314P* |
| 8 | 21.5 | 38.5 | 43.0 | 37.5 | 10.2 | 1.0 | 35 | 280 | 13.5 | 15.0 | 7 | 6 | 55 | 48 | 37 | 91 | MKP1847580314P* |
| 9 | 21.5 | 38.5 | 43.0 | 37.5 | 10.2 | 1.0 | 35 | 315 | 14.5 | 15.5 | 7 | 6 | 55 | 48 | 35 | 91 | MKP1847590314P* |
| 10 | 21.5 | 38.5 | 43.0 | 37.5 | 10.2 | 1.0 | 35 | 350 | 14.5 | 16.0 | 7 | 6 | 55 | 48 | 34 | 91 | MKP1847610315P* |
| 12 | 24.0 | 44.0 | 42.0 | 37.5 | 10.2 | 1.0 | 35 | 420 | 17.5 | 19.5 | 7 | 6 | 55 | 48 | 44 | 77 | MKP1847612314P* |
| 15 | 30.0 | 45.0 | 42.0 | 37.5 | 10.2 / 20.3 | 1.0 | 35 | 525 | 21.0 | 23.0 | 7 | 6 | 55 | 48 | 58 | 63 | MKP1847615314P* |
| 10 | 25.0 | 45.0 | 57.5 | 52.5 | 10.2 | 1.2 | 15 | 150 | 13.5 | 14.5 | 12 | 10 | 105 | 90 | 81 | 55 | MKP1847610314Y* |
| 12 | 25.0 | 45.0 | 57.5 | 52.5 | 10.2 | 1.2 | 15 | 180 | 14.5 | 16.0 | 12 | 10 | 105 | 90 | 77 | 55 | MKP1847612314Y* |
| 15 | 25.0 | 45.0 | 57.5 | 52.5 | 10.2 | 1.2 | 15 | 225 | 16.5 | 18.0 | 12 | 10 | 105 | 90 | 71 | 55 | MKP1847615314Y* |
| 20 | 30.0 | 45.0 | 57.5 | 52.5 | 20.3 | 1.2 | 15 | 300 | 19.5 | 21.5 | 12 | 10 | 105 | 90 | 93 | 45 | MKP1847620314Y* |
| 22 | 35.0 | 50.0 | 57.5 | 52.5 | 20.3 | 1.2 | 15 | 330 | 22.5 | 24.5 | 12 | 10 | 105 | 90 | 117 | 40 | MKP1847622314Y* |
| 25 | 35.0 | 50.0 | 57.5 | 52.5 | 20.3 | 1.2 | 15 | 375 | 24.0 | 26.0 | 12 | 10 | 105 | 90 | 111 | 40 | MKP1847625314Y* |
| 30 | 45.0 | 45.0 | 57.5 | 52.5 | 20.3 | 1.2 | 15 | 450 | - | 29.5 | - | 10 | - | 90 | 187 | 30 | MKP1847630314Y5 |
| 35 | 45.0 | 45.0 | 57.5 | 52.5 | 20.3 | 1.2 | 15 | 525 | - | 32.0 | - | 10 | - | 90 | 187 | 30 | MKP1847635314Y5 |

**Notes**

(1) Intermediate capacitance values are available on request
(2) Standard dimension
(3) Rated voltage pulse slope (dU/dt) R at voltage $U_{NDC}$
(4) Maximum RMS current at 10 kHz, + 85 °C, Capacitance tolerance specified
(5) The ESR (Equivalent Series Resistance) can be calculated as tan δ (f)/(2 x π x f x C)
(6) SPQ = Standard Packing Quantity
(7) Change the * symbols with special code for terminals

## SPECIFIC REFERENCE DATA 350 $V_{RMS}$

**$U_N$ = 350 $V_{AC}$, $U_{NDC}$ = 700 V**

| CAP. (1) | DIMENSIONS (2) (mm) | | | P1 | P2 | Ø $d_t$ | dU/dt (3) | $I_{PEAK}$ | $I_{RMS}$ (4) (A) | | tan δ (5) 1 kHz < ($10^{-4}$) | | tan δ (5) 10 kHz < ($10^{-4}$) | | MASS | SPQ (6) | PART NUMBER (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (µF) | w | h | l | (mm) | (mm) | (mm) | (V/µs) | (A) | 2 pins | 4 pins | 2 pins | 4 pins | 2 pins | 4 pins | ≈ (g) | (pcs) | |
| 1 | 11.0 | 21.0 | 32.0 | 27.5 | - | 0.8 | 100 | 100 | 4.5 | - | 3 | - | 18 | - | 9 | 130 | MKP1847510354K2 |
| 2 | 15.0 | 25.0 | 32.0 | 27.5 | - | 0.8 | 100 | 200 | 7.5 | - | 3 | - | 18 | - | 12 | 100 | MKP1847520354K2 |
| 3 | 18.0 | 28.0 | 32.0 | 27.5 | - | 0.8 | 100 | 300 | 10.0 | - | 3 | - | 18 | - | 15 | 80 | MKP1847530354K2 |
| 4 | 21.0 | 31.0 | 32.0 | 27.5 | - | 0.8 | 100 | 400 | 12.5 | - | 3 | - | 18 | - | 21 | 65 | MKP1847540354K2 |
| 5 | 18.5 | 35.5 | 43.0 | 37.5 | 10.2 | 1.0 | 50 | 250 | 10.5 | 11.5 | 6.5 | 5.5 | 50 | 45 | 30 | 105 | MKP1847550354P* |
| 6 | 18.5 | 35.5 | 43.0 | 37.5 | 10.2 | 1.0 | 50 | 300 | 11.5 | 12.5 | 6.5 | 5.5 | 50 | 45 | 28 | 105 | MKP1847560354P* |
| 7 | 21.5 | 38.5 | 43.0 | 37.5 | 10.2 | 1.0 | 50 | 350 | 13.0 | 14.5 | 6.5 | 5.5 | 50 | 45 | 37 | 91 | MKP1847570354P* |
| 8 | 21.5 | 38.5 | 43.0 | 37.5 | 10.2 | 1.0 | 50 | 400 | 14.0 | 15.5 | 6.5 | 5.5 | 50 | 45 | 34 | 91 | MKP1847580354P* |
| 9 | 24.0 | 44.0 | 42.0 | 37.5 | 10.2 | 1.0 | 50 | 450 | 16.0 | 17.5 | 6.5 | 5.5 | 50 | 45 | 48 | 77 | MKP1847590354P* |
| 10 | 24.0 | 44.0 | 42.0 | 37.5 | 10.2 | 1.0 | 50 | 500 | 16.5 | 18.0 | 6.5 | 5.5 | 50 | 45 | 45 | 77 | MKP1847610354P* |
| 12 | 30.0 | 45.0 | 42.0 | 37.5 | 10.2 / 20.3 | 1.0 | 50 | 600 | 19.5 | 21.5 | 6.5 | 5.5 | 50 | 45 | 60 | 63 | MKP1847612354P* |
| 10 | 25.0 | 45.0 | 57.5 | 52.5 | 10.2 | 1.2 | 25 | 250 | 14.0 | 15.0 | 11 | 9.5 | 100 | 85 | 78 | 55 | MKP1847610354Y* |
| 12 | 25.0 | 45.0 | 57.5 | 52.5 | 10.2 | 1.2 | 25 | 300 | 15.0 | 16.5 | 11 | 9.5 | 100 | 85 | 74 | 55 | MKP1847612354Y* |
| 15 | 25.0 | 45.0 | 57.5 | 52.5 | 10.2 | 1.2 | 25 | 375 | 17.0 | 18.5 | 11 | 9.5 | 100 | 85 | 67 | 55 | MKP1847615354Y* |
| 20 | 30.0 | 45.0 | 57.5 | 52.5 | 20.3 | 1.2 | 25 | 500 | 20.5 | 22.0 | 11 | 9.5 | 100 | 85 | 87 | 45 | MKP1847620354Y* |
| 22 | 35.0 | 50.0 | 57.5 | 52.5 | 20.3 | 1.2 | 25 | 550 | 23.0 | 25.0 | 11 | 9.5 | 100 | 85 | 111 | 40 | MKP1847622354Y* |
| 25 | 35.0 | 50.0 | 57.5 | 52.5 | 20.3 | 1.2 | 25 | 625 | 24.5 | 26.5 | 11 | 9.5 | 100 | 85 | 102 | 40 | MKP1847625354Y* |
| 30 | 45.0 | 45.0 | 57.5 | 52.5 | 20.3 | 1.2 | 25 | 750 | - | 30.5 | - | 9.5 | - | 85 | 187 | 30 | MKP1847630354Y5 |

**Notes**

(1) Intermediate capacitance values are available on request
(2) Standard dimension
(3) Rated voltage pulse slope (dU/dt) R at voltage $U_{NDC}$
(4) Maximum RMS current at 10 kHz, + 85 °C, Capacitance tolerance specified
(5) The ESR (Equivalent Series Resistance) can be calculated as tan δ (f)/(2 x π x f x C)
(6) SPQ = Standard Packing Quantity
(7) Change the * symbols with special code for terminals

## SPECIFIC REFERENCE DATA (under development)

**$U_N$ = 440 $V_{AC}$, $U_{NDC}$ = 1000 V**

| CAP. (1) | DIMENSIONS (2) (mm) | | | P1 | P2 | Ø $d_t$ | dU/dt (3) | $I_{PEAK}$ | $I_{RMS}$ (4) (A) | | tan δ (5) 1 kHz < ($10^{-4}$) | | tan δ (5) 10 kHz < ($10^{-4}$) | | MASS | SPQ (6) | PART NUMBER (7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (µF) | w | h | l | (mm) | (mm) | (mm) | (V/µs) | (A) | 2 pins | 4 pins | 2 pins | 4 pins | 2 pins | 4 pins | ≈ (g) | (pcs) | |
| 1 | 18.5 | 35.5 | 43.0 | 37.5 | 10.2 | 1.0 | 80 | 80 | 6.0 | 7.0 | 3.5 | 3.0 | 15 | 13 | 42 | 105 | MKP1847510444P* |
| 1.5 | 18.5 | 35.5 | 43.0 | 37.5 | 10.2 | 1.0 | 80 | 120 | 7.0 | 8.0 | 3.5 | 3.0 | 15 | 13 | 40 | 105 | MKP1847515444P* |
| 2 | 24.0 | 44.0 | 42.0 | 37.5 | 10.2 | 1.0 | 80 | 160 | 10.0 | 11.0 | 3.5 | 3.0 | 15 | 13 | 65 | 77 | MKP1847520444P* |
| 2.2 | 24.0 | 44.0 | 42.0 | 37.5 | 10.2 | 1.0 | 80 | 176 | 10.0 | 11.0 | 3.5 | 3.0 | 15 | 13 | 64 | 77 | MKP1847522444P* |
| 2.7 | 24.0 | 44.0 | 42.0 | 37.5 | 10.2 | 1.0 | 80 | 216 | 12.0 | 12.5 | 3.5 | 3.0 | 15 | 13 | 61 | 77 | MKP1847527444P* |
| 3 | 30.0 | 45.0 | 42.0 | 37.5 | 10.2 / 20.3 | 1.0 | 80 | 240 | 13.0 | 14.0 | 3.5 | 3.0 | 15 | 13 | 78 | 63 | MKP1847530444P* |
| 3.3 | 30.0 | 45.0 | 42.0 | 37.5 | 10.2 / 20.3 | 1.0 | 80 | 264 | 14.0 | 15.0 | 3.5 | 3.0 | 15 | 13 | 75 | 63 | MKP1847533444P* |
| 4 | 30.0 | 45.0 | 42.0 | 37.5 | 10.2 / 20.3 | 1.0 | 80 | 320 | 15.0 | 16.0 | 3.5 | 3.0 | 15 | 13 | 69 | 63 | MKP1847540444P* |
| 5 | 25.0 | 45.0 | 57.5 | 52.5 | 20.3 | 1.2 | 35 | 175 | 13.0 | 14.0 | 6 | 5.0 | 30 | 25 | 99 | 55 | MKP1847550444Y* |
| 6 | 30.0 | 45.0 | 57.5 | 52.5 | 20.3 | 1.2 | 35 | 210 | 15.0 | 16.0 | 6 | 5.0 | 30 | 25 | 131 | 45 | MKP1847560444Y* |
| 7 | 35.0 | 50.0 | 57.5 | 52.5 | 20.3 | 1.2 | 35 | 245 | 18.0 | 19.0 | 6 | 5.0 | 30 | 25 | 152 | 40 | MKP1847570444Y* |
| 8 | 35.0 | 50.0 | 57.5 | 52.5 | 20.3 | 1.2 | 35 | 280 | 19.0 | 20.0 | 6 | 5.0 | 30 | 25 | 146 | 40 | MKP1847580444Y* |
| 10 | 35.0 | 50.0 | 57.5 | 52.5 | 20.3 | 1.2 | 35 | 280 | 19.0 | 20.0 | 6 | 5.0 | 30 | 25 | 146 | 40 | MKP1847610445Y* |
| 12 | 45.0 | 45.0 | 57.5 | 52.5 | 20.3 | 1.2 | 35 | 350 | 22.0 | 23.0 | 6 | 5.0 | 30 | 25 | 186 | 30 | MKP1847612445Y5 |

**Notes**

(1) Intermediate capacitance values are available on request
(2) Standard dimension
(3) Rated voltage pulse slope (dU/dt) R at voltage $U_{NDC}$
(4) Maximum RMS current at 10 kHz, + 85 °C, Capacitance tolerance specified
(5) The ESR (Equivalent Series Resistance) can be calculated as tan δ (f)/(2 x π x f x C)
(6) SPQ = Standard Packing Quantity
(7) Change the * symbols with special code for terminals

## CONSTRUCTION

Low inductive wound cell elements of metallized polypropylene film, potted with resin in a flame retardant case.

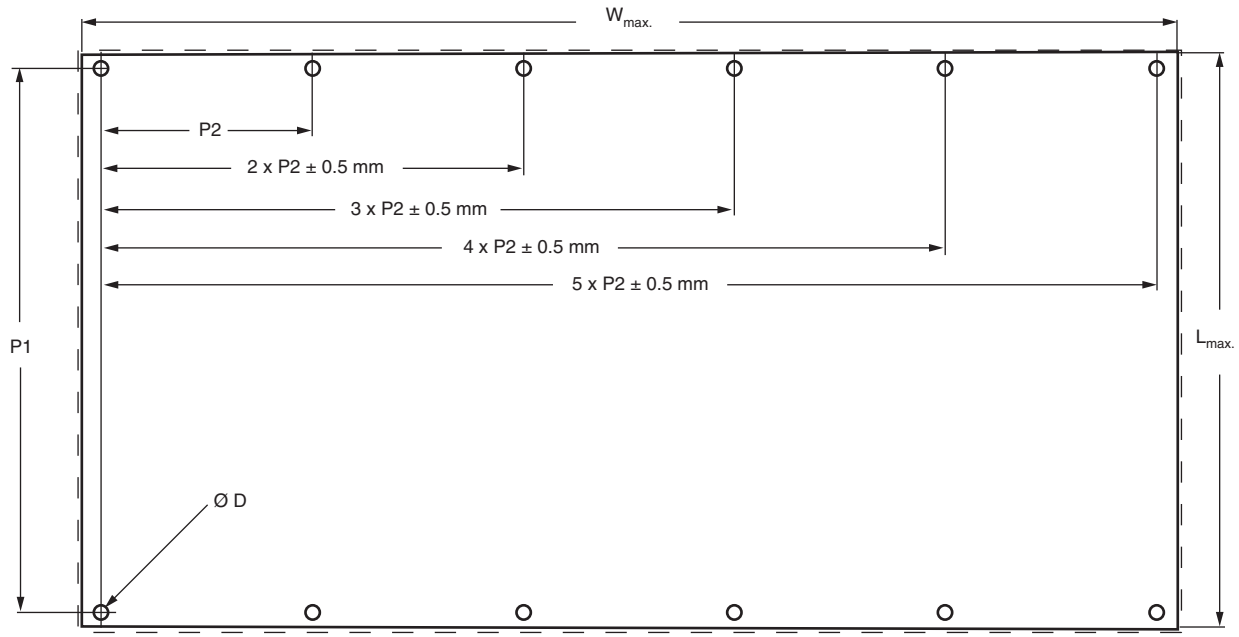
### Specific Method of Mounting to Withstand Vibration and Shock

The capacitor unit is designed for mounting on a printed circuit board.
In order to withstand vibration and shock tests, it must be insured that the stand-off pips are in good contact with the printed circuit board.
The capacitors shall be mechanically fixed by the leads and the body clamped.

### Space Requirements on Printed-Circuit Board

The maximum length and width of film capacitors is shown in the figure:

- Product height with seating plane as given by “IEC 60717” as reference:




| P1 (mm) | $L_{max.}$ (mm) | $W_{max.}$ (mm) | Ø D (mm) | Δh (mm) |
|---|---|---|---|---|
| 27.5 | l + 2 | w + 1.6 | 1.2 | 0.2 |
| 37.5 | l + 3 | w + 2.0 | 1.5 | 0.5 |
| 52.5 | l + 4 | w + 2.4 | 1.7 | 0.5 |

## SOLDERING CONDITIONS

For general soldering conditions and wave soldering profile, we refer to the document:
“Characteristics and Definitions used for Film Capacitors”: www.vishay.com/doc?26033

### Storage Temperature

- Storage temperature: $T_{stg}$ = - 25 °C to + 40 °C
  RH maximum 80 % without condensation.

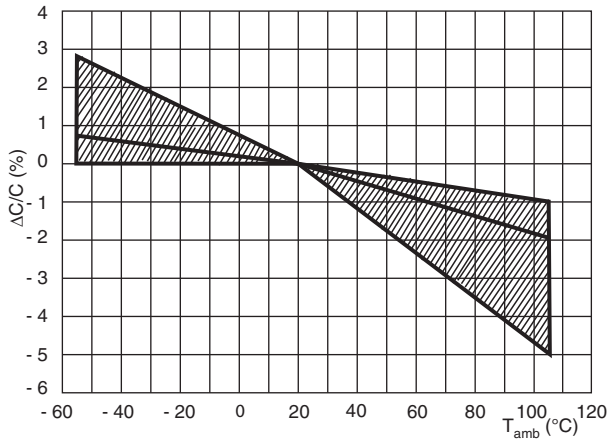
#### Ratings and Characteristics Reference Conditions

Unless otherwise specified, all electrical values apply to an ambient temperature of 23 °C ± 1 °C, an atmospheric pressure of 86 kPa to 106 kPa and a relative humidity of 50 % ± 2 %.

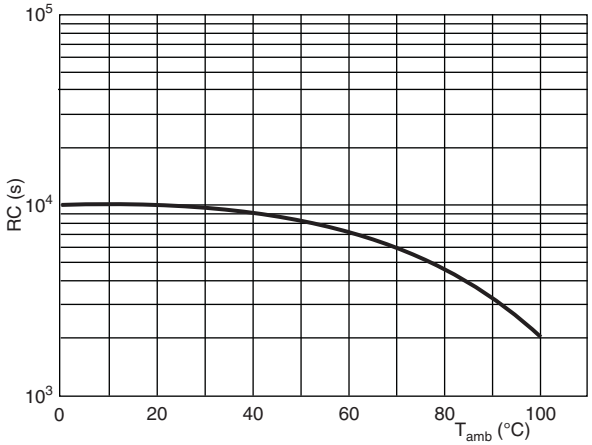
For reference testing, a conditioning period shall be applied over 96 h ± 4 h by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

## CHARACTERISTICS

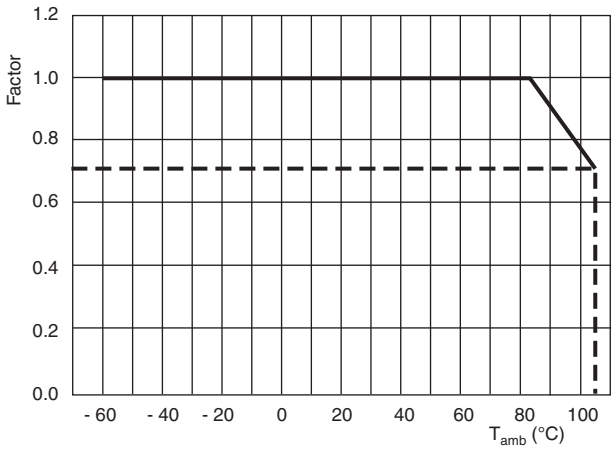
Capacitance as a function of ambient temperature (typical curve)



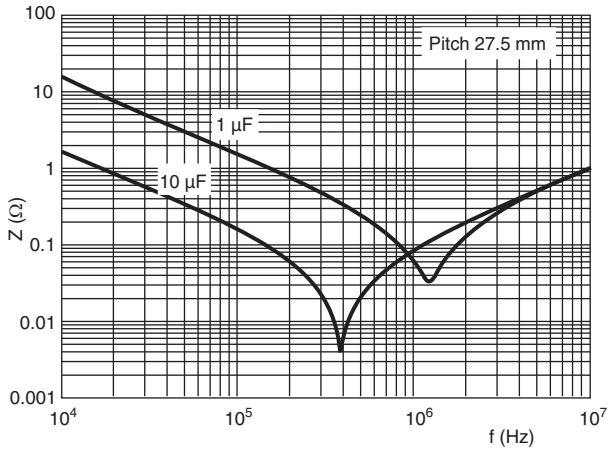

Insulation resistance as a function of ambient temperature (typical curve)



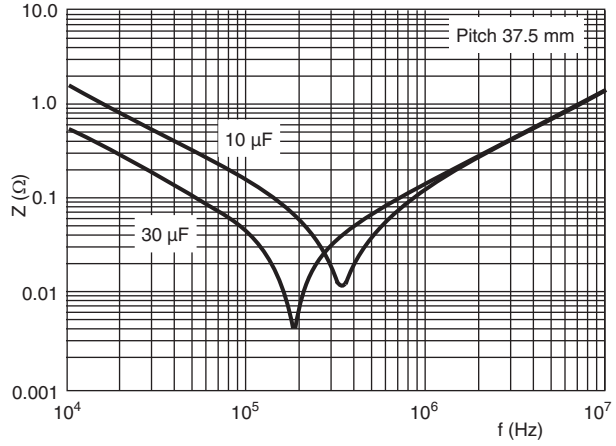

RMS voltage in function of temperature



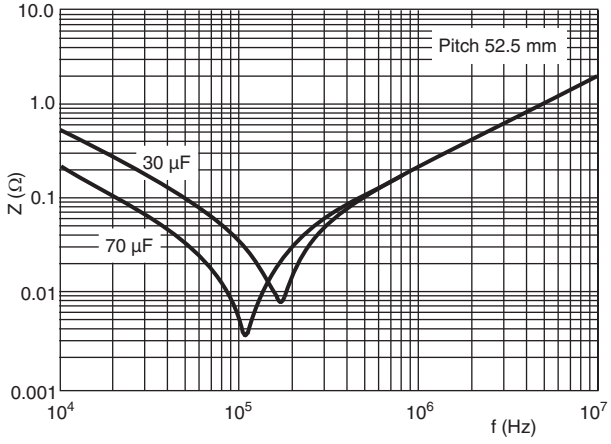

Impedance vs.frequency (typical curve)




Impedance vs. frequency (typical curve)




Impedance vs. frequency (typical curve)



## HEAT CONDUCTIVITY

| DIMENSIONS (mm) | | | HEAT CONDUCTIVITY (mW/°C) | | |
|---|---|---|---|---|---|
| w (mm) | h | l | PITCH 27.5 mm | PITCH 37.5 mm | PITCH 52.5 mm |
| 9.0 | 19.0 | 32.0 | 32 | - | - |
| 11.0 | 21.0 | 32.0 | 38 | - | - |
| 13.0 | 23.0 | 32.0 | 44 | - | - |
| 15.0 | 25.0 | 32.0 | 50 | - | - |
| 18.0 | 28.0 | 32.0 | 59 | - | - |
| 21.0 | 31.0 | 32.0 | 69 | - | - |
| 18.5 | 35.5 | 43.0 | - | 89 | - |
| 21.5 | 38.5 | 43.0 | - | 102 | - |
| 24.0 | 44.0 | 42.0 | - | 117 | - |
| 30.0 | 45.0 | 42.0 | - | 135 | - |
| 25.0 | 45.0 | 57.5 | - | - | 155 |
| 30.0 | 45.0 | 57.5 | - | - | 170 |
| 35.0 | 50.0 | 57.5 | - | - | 199 |
| 45.0 | 45.0 | 57.5 | - | - | 216 |

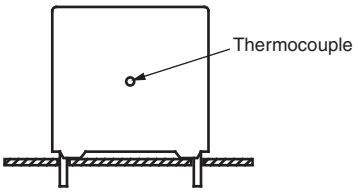
### Power Dissipation and Maximum Component Temperature Rise

The power dissipation must be limited in order not to exceed the maximum allowed component temperature rise as a function of the free air ambient temperature.

The component temperature rise ($\Delta T$) can be measured or calculated by $\Delta T = P/G$:

- $\Delta T$ = component temperature rise (°C) with a maximum of 15 °C
- P = power dissipation of the component (mW)
- G = heat conductivity of the component (mW/°C)

## MEASURING THE COMPONENT TEMPERATURE




The case temperature is measured in unloaded ($T_{amb}$) and maximum loaded condition ($T_C$).
The temperature rise is given by $\Delta T = T_C - T_{amb}$.
To avoid thermal radiation or convection, the capacitor must be tested in a closed area from air circulation.

## APPLICATION NOTE AND LIMITING CONDITIONS

These capacitors are not suitable for mains applications as across-the-line capacitors without additional protection.
These mains applications are strictly regulated in safety standards and therefore electromagnetic interference suppression capacitors conforming the standards must be used.
To select the capacitor for a certain application, the following conditions must be checked:

- The peak voltage ($U_{P+}$) shall not be greater than $\sqrt{2} \times U_{RMS}$
- The peak-to-peak ripple voltage ($U_{PP}$) shall not be greater than $0.2 \times \sqrt{2} \times U_{RMS}$
- The voltage pulse slope (dU/dt) shall not exceed the rated pulse slope at the DC voltage rating.
  If the pulse voltage is lower than the rated DC voltage, the rated voltage pulse slope may be multiplied by $U_{NDC}$ and divided by the applied voltage.
  For all other pulses following equation must be fulfilled:

$$2 \times \int_0^T \left(\frac{dU}{dt}\right)^2 \times dt < U_{Ndc} \times \left(\frac{dU}{dt}\right)_{rated}$$

T is the pulse duration

- The maximum component surface temperature must be lower than 105 °C and maximum temperaure rise between case and free air ambient shall be lower than 15 °C.

## INSPECTION REQUIREMENTS

**General Notes**
Sub-clause numbers of tests and performance requirements refer to the “Sectional Specification, Publication IEC 61071”.

| SUB-CLAUSE NUMBER AND TEST | CONDITIONS | PERFORMANCE REQUIREMENTS |
|---|---|---|
| **ROUTINE TEST-FINAL INSPECTION** | | |
| 5.14.2.1 External inspection, visual examination | | Legible marking as specified |
| 5.14.2.2 Dimensions | | See specification drawing |
| 5.3.1 Capacitance | 1 kHz at room temperature | See specific reference data |
| 5.3.2 tan $\delta$ | 1 kHz at room temperature<br>10 kHz at room temperature | See specific reference data |
| 5.5.1.2 Voltage test between terminal | 1.5 x $U_{NDC}$ at $T_{amb}$<br>Duration 10 s | No visible damage or puncture<br>No flashover |
| 5.7 Insulation resistance | Measuring voltage 100 V at room temperature<br>Duration 1 min | See specific reference data |
| **TYPE TESTS** | | |
| 5.14.2 External inspection | Check for finish, marking and overall dimensions | Legible marking and finish as specified<br>Dimensions: see specific drawing |
| 5.14.0 Initial measurements | Capacitance at 1 kHz<br>tan $\delta$ at 10 kHz | |
| 5.14.1.1.4 Robustness of terminations IEC 60068-2-21 | Tensile Ua1<br>Wire diameter section load<br>≤ 0.8 mm ≤ 0.5 $mm^2$ 10 N<br>≤ 1.25 mm ≤ 1.2 $mm^2$ 20 N<br>Duration 10 s ± 1 s<br><br>Bending Ub method 1<br>Wire diameter section load<br>≤ 0.8 mm ≤ 0.05 $mm^3$ 10 N<br>≤ 1.25 mm ≤ 0.019 $mm^3$ 20 N<br>4 x 90 °,<br>Duration 2 s to 3 s/bend | |
| 5.14.1.6 Resistance to soldering heat IEC 60068-2-20 | No predrying, Method 1A<br>Solder bath: 280 °C<br>Duration 10 s ± 1 s | |
| 5.14.4 Final measurements | Capacitance<br>tan $\delta$ | $\lvert\Delta C/C\rvert \leq 0.5$ %<br>Increase of tan $\delta \leq 0.0050$<br>Compared to values measured in 5.14.0 |
| 5.14.0 Initial measurements | Capacitance at 1 kHz<br>tan $\delta$ at 10 kHz | |
| 5.14.3.1 Vibration IEC 60068-2-6 | 10 Hz to 55 Hz: amplitude ± 0.35 mm or acceleration 98 $m/s^2$<br>Test duration: 10 frequency cycles, 3 axes offset from each other by 90°<br>1 octave/min<br>Visual examination | No visible damage |
| 5.14.3.2 Shock or impact IEC 60068-2-6 | Pulse shape: half sine<br>Acceleration: 490 $m/s^2$<br>Duration of pulse: 11 ms<br>Visual examination | No visible damage |
| 5.14.4 Final measurements | Capacitance<br>tan $\delta$ | $\lvert\Delta C/C\rvert \leq 0.5$ %<br>Increase of tan $\delta \leq 0.0050$<br>Compared to values measured in 5.14.0 |

| SUB-CLAUSE NUMBER AND TEST | CONDITIONS | PERFORMANCE REQUIREMENTS |
|---|---|---|
| 5.5.3.1 Initial measurements | Capacitance at 1 kHz<br>tan $\delta$ at 10 kHz<br>R insulation | |
| 5.5.3.2 DC voltage test between terminal | 1.5 x $U_{NDC}$ at $T_{amb}$<br>Duration 60 s | |
| 5.5.3.3 Final measurements | Capacitance<br>tan $\delta$<br>R insulation | $\lvert\Delta C/C\rvert \leq 0.5$ %<br>Increase of tan $\delta \leq 0.0050$<br>R insulation $\geq 50$ % of specified values |
| 5.9.1 Initial measurements | Capacitance at 1 kHz<br>tan $\delta$ at 10 kHz | |
| 5.9.2 Surge discharge test | 1.1 x $U_{NDC}$<br>Number of discharges: 5<br>Time lapse: every 2 min (10 min total) | |
| 5.9.3 DC voltage test between terminal | Within 5 min after the surge discharge test<br>Duration 10 s<br>1.5 x $U_{NDC}$ at $T_{amb}$ | |
| 5.9.3 Final measurements | Capacitance<br>tan $\delta$ at 10 kHz | $\lvert\Delta C/C\rvert \leq 1.0$ %<br>tan $\delta \leq 1.2$ initial tan $\delta + 0.0001$<br>Compared to values measured in 5.9.1 |
| 5.11.1 Initial measurements | Capacitance at 1 kHz<br>tan $\delta$ at 10 kHz | |
| 5.11.2 Self healing test | 1.5 x $U_{NDC}$<br>Duration 10 s<br>Number of clearings $\leq 5$<br>Clearing = voltage drop of 5 %<br>increase the voltage at 100 V/s till 5 clearings occur<br>with a max. of 2.5 x $U_{NDC}$<br>for a duration of 10 s | |
| 5.11.3 Final measurements | Capacitance<br>tan $\delta$ | $\lvert\Delta C/C\rvert \leq 0.5$ %<br>tan $\delta \leq 1.2$ x initial tan $\delta + 0.0001$<br>Compared to values measured in 5.11.1 |
| 5.13.0 Initial measurements | Capacitance at 1 kHz<br>tan $\delta$ at 10 kHz | |
| 5.13.1 Change of temperature acc. to IEC 60068-2-14 | Test Nb<br>$T_{max.} = 85$ °C<br>$T_{min.} = -40$ °C<br>Transition time: 1 h, equivalent to 1 °C/min<br>5 cycles | |
| 5.13.2 Damp heat steady state Acc. to IEC 60068-2-78 | Test Ca<br>T= 40 °C ± 2 °C<br>RH = 93 % ± 3 %<br>Duration 56 days | |
| 5.5.3.2 DC voltage test between terminal | 1.5 x $U_{NDC}$ at ambient temperature<br>Duration 10 s | |
| 5.13.3 Final measurements | Visual examination<br><br>Capacitance<br>tan $\delta$ at 10 kHz | No puncturing or flashover<br>Self healing punctures are permitted<br>$\lvert\Delta C/C\rvert \leq 2.0$ %<br>Increase of tan $\delta \leq 0.0150$<br>Compared to values measured in 5.13.0 |
| 5.10.0 Initial measurements | Capacitance at 1 kHz<br>tan $\delta$ at 10 kHz | |
| 5.10.1 Thermal stability test under overload conditions | Natural cooling $T_{amb} \pm 5$ °C<br>1.21 x $P_{max.} = (U_2/2) \times W_2 \times C \times \tan \delta =$<br>121 x $(I^2_{max.}/W_2 \times C) \times \tan \delta_2$ with<br>$W_2 = 2 \times \pi \times f_2$<br>for $I_{max.}$ (see specific reference data)<br>$f_2 = 10$ kHz<br>Duration 48 h | |
| 5.10.2 Final measurements | Measure the temperature every 1.5 h during the last 6 h<br>Capacitance<br>tan $\delta$ at 10 kHz | temperature rise < 1 °C<br>$\lvert\Delta C/C\rvert \leq 2$ %<br>Increase of tan $\delta \leq 1.2$ x initial $\delta + 0.0150$ |

| SUB-CLAUSE NUMBER AND TEST | CONDITIONS | PERFORMANCE REQUIREMENTS |
|---|---|---|
| 5.12 Resonance frequency measurement | Impedance analyser at $T_{amb}$ | < 0.9 times the value as specified in typical curve “Resonant frequency” of this specification |
| 5.15.0 Initial measurements | Capacitance at 1 kHz<br>tan $\delta$ at 10 kHz | |
| 5.15.1 Endurance test between terminals | Sequence<br>1.25 x $U_N$ at $T_{max.}$ = 85 °C<br>1.0 x $U_N$ at $T_{max.}$ = 105 °C<br>Duration 500 h<br>1000 x discharge at 1.4 x $\hat{i}$ (maximum repetitive peak current in continuous operation)<br>1.25 x $U_N$ at $T_{max.}$ = 85 °C<br>1.0 x $U_N$ at $T_{max.}$ = 105 °C | |
| 5.15.2 Final measurements | Duration 500 h<br><br>Capacitance<br>tan $\delta$ | $\lvert\Delta C/C\rvert \leq 3$ %<br>Increase of tan $\delta \leq 0.0150$<br>Compared to values measured in 5.15.0 |
| 5.16.3.0 Initial measurements | Capacitance at 1 kHz | |
| 5.16.3.1 Destruction test sequence<br>High DC voltage test | The capacitors must be put in an oven at Tmax. = 105 °C/2 h and cooled down<br>Product enveloped with cheese cloth | |
| High DC voltage test<br>(limited to 200 mA) | 3 x $U_{NDC}$ with minimum 2000 $V_{DC}$<br>Duration 1 min | |
| | Discharge the capacitor<br>Duration 1 min | |
| | $AC_{RMS}$ voltage = $U_{NDC}/2 \times \sqrt{2}$<br>Duration = 15 s | |
| High AC voltage test | The above sequence shall be repeated until the test sample capacitance loss 5 % of its initial measurement in 5.16.3-0. | |
| 5.16.3.2 Final measurements | Visual examination | No burning of the cheese cloth<br>The dielectric must withstand the test sequence conducted |

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