

Metallized Polypropylene Film Capacitors DC-Link Capacitor



FEATURES

- Slim line, low building height
- Very long useful life time: Up to 100 000 h at U_{NDC} and 70 °C
- High ripple current capability, low ESR, low ESL
- Temperature range: 105 °C
- Mounting: Radial
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE
GREEN
(5-2008)

APPLICATIONS

- PV micro inverters
- LED street lighting
- On board chargers (EV/HEV), battery chargers

| QUICK REFERENCE DATA | |
|--|--|
| Rated capacitance range | 2 μF to 100 μF |
| Capacitance tolerance | 5 % |
| Rated voltage range, U_{NDC} | 500 V to 1000 V |
| Climatic testing class | 40/105/56 |
| Rated temperature | 85 °C |
| Maximum permissible case temperature | 105 °C, observing voltage derating |
| Maximum applicable peak to peak ripple voltage | 0.2 x U_{NDC} |
| Reference standards | IEC 61071, IEC 60068 |
| Dielectric | Polypropylene film |
| Electrodes | Metallized dielectric capacitor |
| Construction | Mono construction |
| Encapsulation | Plastic case sealed with resin; flame retardant |
| Terminals | Tinned wire |
| Self inductance (L_s) | < 1 nH per mm of lead spacing |
| Withstanding DC voltage between terminals ⁽¹⁾ | 1.5 U_{NDC} for 10 s, cut off current 10 mA, rise time ≤ 1000 V/s |
| Insulation resistance | RC between leads, after 1 min > 10 000 s For $U_{NDC} \leq 500$ V measuring voltage 100 V For $U_{NDC} > 500$ V measuring voltage 500 V |
| Life time expectancy | Useful life time: > 100 000 h at U_{NDC} and 70 °C FIT: < 10 x 10 ⁻⁹ /h (10 per 10 ⁹ component h) at 0.5 x U_{NDC} , 40 °C |
| 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 |

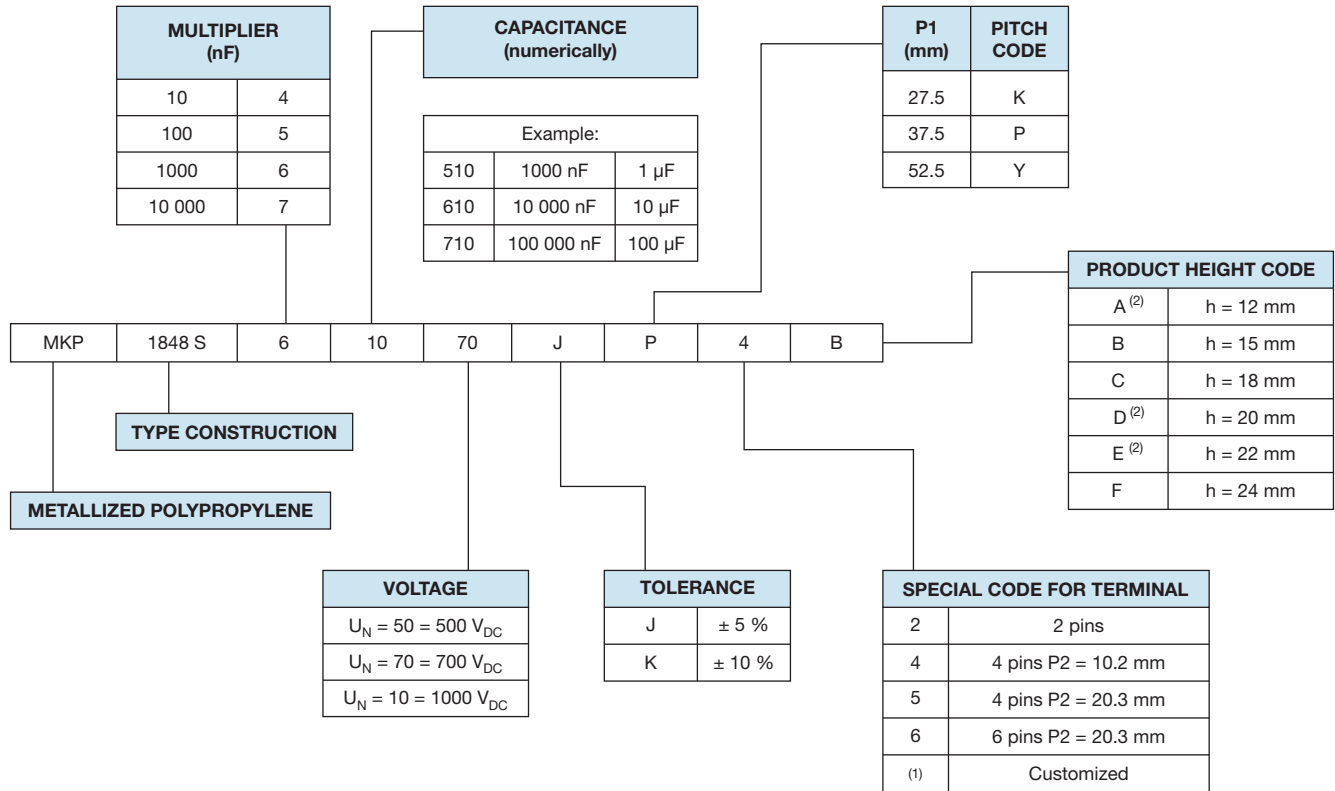
Notes

- For more detailed data and test requirements, contact dc-film@vishay.com
- For general information like characteristics and definitions used for film capacitors follow the link: www.vishay.com/doc?28147
- ⁽¹⁾ See document "Voltage Proof Test for Metallized Capacitors" (www.vishay.com/doc?28169)

| DC VOLTAGE RATINGS | | | |
|----------------------|-------|-------|--------|
| U_{NDC} at 85 °C | 500 V | 700 V | 1000 V |
| U_{OPDC} at 70 °C | 600 V | 800 V | 1200 V |
| U_{OPDC} at 105 °C | 350 V | 500 V | 750 V |



COMPOSITION OF CATALOG NUMBER



Notes

- (1) Tabs terminals or customized terminals are available on request
- (2) Product height on request

| DIMENSIONS in millimeters | |
|---|--|
| <p> $P1 \pm 0.5 \text{ mm}$ $lt = 6 \text{ mm} + 0 \text{ mm} / - 1 \text{ mm}$ </p> | |
| <p> $P1 \text{ and } P2 \pm 0.5 \text{ mm}$ $lt = 6 \text{ mm} + 0 \text{ mm} / - 2 \text{ mm}$ </p> | |
| <p> $P1 \text{ and } P2 \pm 0.5 \text{ mm}$ $lt = 6 \text{ mm} + 0 \text{ mm} / - 2 \text{ mm}$ </p> | |

Notes

- Standard dimension
- $\varnothing dt \pm 10 \%$ of standard diameter specified



| ELECTRICAL DATA AND ORDERING CODE | | | | | | | | | | | | | | | | |
|-----------------------------------|----------------|------------------|-----------------------|------|------|------------|------------|-----------------|--------------------------|-----------------------------|-----------|-----------------|-----------|--|-----------|-------------------|
| U _{NDC} (V) | HEIGHT (mm) | CAP. (7) (µF) | DIMENSION (5) (mm) | | | P1 (mm) | P2 (mm) | dV/dt (V/µs) | I _{PEAK} (A) | I _{RMS} (2) (A) | | ESR (3) (mΩ) | | tan δ 10 kHz (< 10 ⁻⁴) (4) | | ORDERING CODE (1) |
| | | | w | h | l | | | | | 2 PINS | 4 PINS | 2 PINS | 4 PINS | 2 PINS | 4 PINS | |
| | | | | | | | | | | | | | | | | |
| 500 | 12 | 5 | 24.0 | 12.0 | 31.5 | 27.5 | - | 30 | 150 | 4 | - | 13 | - | 60 | - | MKP1848S55050JK2A |
| | 15 | 7 | 27.0 | 15.0 | 31.5 | 27.5 | - | 30 | 210 | 5 | - | 10 | - | 60 | - | MKP1848S57050JK2B |
| | | 10 | 27.0 | 15.0 | 42.0 | 37.5 | 10.2 | 15 | 150 | 5 | 5 | 10 | 7.5 | 125 | 110 | MKP1848S61050JP*B |
| | | 15 | 33.0 | 15.0 | 42.0 | 37.5 | 10.2 | 15 | 225 | 6.5 | 7 | 7 | 5 | 125 | 110 | MKP1848S61550JP*B |
| | | 20 | 33.0 | 15.0 | 57.5 | 52.5 | 20.3 | 7 | 140 | 6 | 6.5 | 9.5 | 8 | 250 | 220 | MKP1848S62050JY*B |
| | | 30 | 45.0 | 15.0 | 57.5 | 52.5 | 20.3 | 7 | 210 | 8.5 | 9 | 6.5 | 5.5 | 250 | 220 | MKP1848S63050JY*B |
| | | 50 (6) | 62.0 | 15.0 | 57.5 | 52.5 | 20.3 | 7 | 350 | - | 13.5 | - | 3.5 | - | 220 | MKP1848S65050JY6B |
| | 18 | 10 | 24.0 | 18.0 | 42.0 | 37.5 | 10.2 | 15 | 150 | 5 | 5.5 | 10 | 7.5 | 125 | 110 | MKP1848S61050JP*C |
| | | 15 | 27.0 | 18.0 | 42.0 | 37.5 | 10.2 | 15 | 225 | 6.5 | 7 | 6.5 | 5 | 125 | 110 | MKP1848S61550JP*C |
| | | 20 | 39.0 | 18.0 | 42.0 | 37.5 | 10.2 | 15 | 300 | 8.5 | 9 | 5 | 4 | 125 | 110 | MKP1848S62050JP*C |
| | | 30 | 35.0 | 18.0 | 57.5 | 52.5 | 20.3 | 7 | 210 | 8 | 8.5 | 6.5 | 5.5 | 250 | 220 | MKP1848S63050JY*C |
| | | 50 | 50.0 | 18.0 | 57.5 | 52.5 | 20.3 | 7 | 350 | - | 12.5 | - | 3.5 | 250 | 220 | MKP1848S65050JY5C |
| | 24 | 20 | 30.0 | 24.0 | 42.0 | 37.5 | 10.2 | 15 | 300 | 8.5 | 9 | 5 | 4 | 125 | 110 | MKP1848S62050JP*F |
| | | 30 | 39.0 | 24.0 | 42.0 | 37.5 | 10.2 | 15 | 450 | 11 | 12 | 3.5 | 2.5 | 125 | 110 | MKP1848S63050JP*F |
| | | 50 | 39.0 | 24.0 | 57.5 | 52.5 | 20.3 | 7 | 350 | 11.5 | 12.5 | 4 | 3.5 | 250 | 220 | MKP1848S65050JY*F |
| | | 100 (6) | 70.0 | 24.0 | 57.5 | 52.5 | 20.3 | 7 | 700 | - | 22 | - | 2 | - | 220 | MKP1848S71050JY6F |
| 700 | 12 | 3 | 24.0 | 12.0 | 31.5 | 27.5 | - | 35 | 105 | 3.5 | - | 14 | - | 45 | - | MKP1848S53070JK2A |
| | 15 | 5 | 27.0 | 15.0 | 31.5 | 27.5 | - | 35 | 175 | 5 | - | 8 | - | 45 | - | MKP1848S55070JK2B |
| | | 7 | 27.0 | 15.0 | 42.0 | 37.5 | 10.2 | 17 | 119 | 5 | 5 | 15 | 11.5 | 110 | 95 | MKP1848S57070JP*B |
| | | 10 | 33.0 | 15.0 | 42.0 | 37.5 | 10.2 | 17 | 170 | 6 | 6.5 | 11 | 8 | 110 | 95 | MKP1848S61070JP*B |
| | | 15 | 33.0 | 15.0 | 57.5 | 52.5 | 20.3 | 8 | 120 | 6 | 6.5 | 12 | 10 | 220 | 200 | MKP1848S61570JY*B |
| | | 20 | 45.0 | 15.0 | 57.5 | 52.5 | 20.3 | 8 | 160 | 8 | 8.5 | 9 | 7.5 | 220 | 200 | MKP1848S62070JY*B |
| | | 30 (6) | 62.0 | 15.0 | 57.5 | 52.5 | 20.3 | 8 | 240 | - | 12 | - | 5 | - | 200 | MKP1848S63070JY6B |
| | 18 | 7 | 24.0 | 18.0 | 42.0 | 37.5 | 10.2 | 17 | 119 | 5 | 5 | 15 | 11.5 | 110 | 95 | MKP1848S57070JP*C |
| | | 10 | 27.0 | 18.0 | 42.0 | 37.5 | 10.2 | 17 | 170 | 6 | 6.5 | 11 | 8 | 110 | 95 | MKP1848S61070JP*C |
| | | 15 | 39.0 | 18.0 | 42.0 | 37.5 | 10.2 | 17 | 255 | 8.5 | 9 | 7 | 5.5 | 110 | 95 | MKP1848S61570JP*C |
| | | 20 | 35.0 | 18.0 | 57.5 | 52.5 | 20.3 | 8 | 160 | 7.5 | 8 | 9 | 7.5 | 220 | 200 | MKP1848S62070JY*C |
| | | 30 | 50.0 | 18.0 | 57.5 | 52.5 | 20.3 | 8 | 240 | - | 11.5 | - | 5 | - | 200 | MKP1848S63070JY5C |
| | 24 | 15 | 30.0 | 24.0 | 42.0 | 37.5 | 10.2 | 17 | 255 | 8.5 | 9 | 7 | 5.5 | 110 | 95 | MKP1848S61570JP*F |
| | | 20 | 39.0 | 24.0 | 42.0 | 37.5 | 10.2 | 17 | 340 | 10.5 | 11.5 | 6 | 4 | 110 | 95 | MKP1848S62070JP*F |
| | | 30 | 39.0 | 24.0 | 57.5 | 52.5 | 20.3 | 8 | 240 | 10.5 | 11 | 6 | 5 | 220 | 200 | MKP1848S63070JY*F |
| | | 50 (6) | 70.0 | 24.0 | 57.5 | 52.5 | 20.3 | 8 | 400 | - | 18 | - | 3 | - | 200 | MKP1848S65070JY6F |



| ELECTRICAL DATA AND ORDERING CODE | | | | | | | | | | | | | | | | |
|-----------------------------------|----------------|-----------------------------|----------------------------------|------|------|------------|------------|-----------------|--------------------------|--|-----------|----------------------------|-----------|---|-----------|------------------------------|
| U _{NDC} (V) | HEIGHT (mm) | CAP. ⁽⁷⁾ (μF) | DIMENSION ⁽⁵⁾ (mm) | | | P1 (mm) | P2 (mm) | dV/dt (V/μs) | I _{PEAK} (A) | I _{RMS} ⁽²⁾ (A) | | ESR ⁽³⁾ (mΩ) | | tan δ 10 kHz ($< 10^{-4}$) ⁽⁴⁾ | | ORDERING CODE ⁽¹⁾ |
| | | | w | h | l | | | | | 2 PINS | 4 PINS | 2 PINS | 4 PINS | 2 PINS | 4 PINS | |
| | | | | | | | | | | | | | | | | |
| 1000 | 12 | 2 | 24.0 | 12.0 | 31.5 | 27.5 | - | 50 | 100 | 3 | - | 16 | - | 40 | - | MKP1848S52010JK2A |
| | 15 | 5 | 27.0 | 15.0 | 42.0 | 37.5 | 10.2 | 25 | 125 | 4.5 | 4.5 | 16 | 11.5 | 105 | 90 | MKP1848S55010JP*B |
| | | 7 | 33.0 | 15.0 | 42.0 | 37.5 | 10.2 | 25 | 175 | 5.5 | 6 | 12 | 8 | 105 | 90 | MKP1848S57010JP*B |
| | | 10 | 33.0 | 15.0 | 57.5 | 52.5 | 20.3 | 12 | 120 | 5.5 | 6 | 13 | 10 | 160 | 140 | MKP1848S61010JY*B |
| | | 15 | 45.0 | 15.0 | 57.5 | 52.5 | 20.3 | 12 | 180 | 7.5 | 8 | 9 | 6.5 | 160 | 140 | MKP1848S61510JY*B |
| | | 20 ⁽⁶⁾ | 62.0 | 15.0 | 57.5 | 52.5 | 20.3 | 12 | 240 | - | 11 | - | 5 | - | 140 | MKP1848S62010JY6B |
| | 18 | 3 | 24.0 | 18.0 | 42.0 | 37.5 | 10.2 | 25 | 75 | 3.5 | 3.5 | 27 | 19 | 105 | 90 | MKP1848S53010JP*C |
| | | 5 | 27.0 | 18.0 | 42.0 | 37.5 | 10.2 | 25 | 125 | 4.5 | 5 | 16 | 11.5 | 105 | 90 | MKP1848S55010JP*C |
| | | 7 | 39.0 | 18.0 | 42.0 | 37.5 | 10.2 | 25 | 175 | 6.5 | 7 | 12 | 8 | 105 | 90 | MKP1848S57010JP*C |
| | | 10 | 39.0 | 18.0 | 42.0 | 37.5 | 10.2 | 25 | 250 | 7.5 | 8 | 8 | 6 | 105 | 90 | MKP1848S61010JP*C |
| | | 15 | 50.0 | 18.0 | 57.5 | 52.5 | 20.3 | 12 | 180 | - | 9 | - | 6.5 | - | 140 | MKP1848S61510JY5C |
| | | 20 | 50.0 | 18.0 | 57.5 | 52.5 | 20.3 | 12 | 240 | - | 10 | - | 5 | - | 140 | MKP1848S62010JY5C |
| | 24 | 7 | 30.0 | 24.0 | 42.0 | 37.5 | 10.2 | 25 | 175 | 6.5 | 6.5 | 12 | 8 | 105 | 90 | MKP1848S57010JP*F |
| | | 10 | 39.0 | 24.0 | 42.0 | 37.5 | 10.2 | 25 | 250 | 8.5 | 9 | 8 | 6 | 105 | 90 | MKP1848S61010JP*F |
| | | 15 | 39.0 | 24.0 | 57.5 | 52.5 | 20.3 | 12 | 180 | 8 | 8.5 | 9 | 6.5 | 160 | 140 | MKP1848S61510JY*F |
| | | 20 | 39.0 | 24.0 | 57.5 | 52.5 | 20.3 | 12 | 240 | 9.5 | 10 | 7 | 5 | 160 | 140 | MKP1848S62010JY*F |
| | | 30 ⁽⁶⁾ | 70.0 | 24.0 | 57.5 | 52.5 | 20.3 | 12 | 360 | - | 15.5 | - | 4 | - | 140 | MKP1848S63010JY6F |

Notes

- (1) Change the * symbol with special code for the terminals
- (2) Maximum RMS current at 10 kHz, + 85 °C, Δt = + 15 °C, capacitance tolerance ≤ ± 5 %
- (3) Equivalent series resistance typical values at 10 kHz
- (4) Maximum tan δ values
- (5) Standard dimension
- (6) 6 pins
- (7) Intermediate capacitance values available on request

| PACKAGING INFORMATION | | | | | | |
|-------------------------|----------------|-----------------------------|------|------------------------------|-------------|-----------------------------|
| U _{NDC} (V) | HEIGHT (mm) | CAP. ⁽¹⁾ (μF) | Ø dt | ORDERING CODE ⁽¹⁾ | MASS (g) | SPQ ⁽³⁾ (pcs) |
| 500 | 12 | 5 | 0.8 | MKP1848S55050JK2A | 7 | 99 |
| | 15 | 7 | 0.8 | MKP1848S57050JK2B | 10.5 | 90 |
| | | 10 | 1.0 | MKP1848S61050JP*B | 14 | 70 |
| | | 15 | 1.0 | MKP1848S61550JP*B | 18.5 | 56 |
| | | 20 | 1.2 | MKP1848S62050JY*B | 22.5 | 40 |
| | | 30 | 1.2 | MKP1848S63050JY*B | 31.5 | 30 |
| | | 50 ⁽²⁾ | 1.2 | MKP1848S65050JY6B | 43 | 20 |
| | 18 | 10 | 1.0 | MKP1848S61050JP*C | 15 | 77 |
| | | 15 | 1.0 | MKP1848S61550JP*C | 15.5 | 70 |
| | | 20 | 1.0 | MKP1848S62050JP*C | 25 | 49 |
| | | 30 | 1.2 | MKP1848S63050JY*C | 30.5 | 40 |
| | | 50 | 1.2 | MKP1848S65050JY5C | 41.5 | 25 |
| | 24 | 20 | 1.0 | MKP1848S62050JP*F | 25 | 63 |
| | | 30 | 1.0 | MKP1848S63050JP*F | 32 | 49 |
| | | 50 | 1.2 | MKP1848S65050JY*F | 41.5 | 40 |
| | | 100 ⁽²⁾ | 1.2 | MKP1848S71050JY6F | 78 | 20 |



| PACKAGING INFORMATION | | | | | | |
|-------------------------|----------------|-----------------------------|------|------------------------------|-------------|-----------------------------|
| U _{NDC} (V) | HEIGHT (mm) | CAP. ⁽¹⁾ (µF) | Ø dt | ORDERING CODE ⁽¹⁾ | MASS (g) | SPQ ⁽³⁾ (pcs) |
| 700 | 12 | 3 | 0.8 | MKP1848S53070JK2A | 6.5 | 99 |
| | 15 | 5 | 0.8 | MKP1848S55070JK2B | 9 | 90 |
| | | 7 | 1.0 | MKP1848S57070JP*B | 12.5 | 70 |
| | | 10 | 1.0 | MKP1848S61070JP*B | 16 | 56 |
| | | 15 | 1.2 | MKP1848S61570JY*B | 21.5 | 40 |
| | | 20 | 1.2 | MKP1848S62070JY*B | 32.5 | 30 |
| | | 30 ⁽²⁾ | 1.2 | MKP1848S63070JY6B | 43 | 20 |
| | 18 | 7 | 1.0 | MKP1848S57070JP*C | 13 | 77 |
| | | 10 | 1.0 | MKP1848S61070JP*C | 15.5 | 70 |
| | | 15 | 1.0 | MKP1848S61570JP*C | 22 | 49 |
| | | 20 | 1.2 | MKP1848S62070JY*C | 29.5 | 40 |
| | | 30 | 1.2 | MKP1848S62570JY5C | 41.5 | 25 |
| | 24 | 15 | 1.0 | MKP1848S61570JP*F | 21 | 63 |
| | | 20 | 1.0 | MKP1848S62070JP*F | 28.5 | 49 |
| | | 30 | 1.2 | MKP1848S63070JY*F | 39.5 | 40 |
| | | 50 ⁽²⁾ | 1.2 | MKP1848S65070JY6F | 83 | 20 |
| 1000 | 12 | 2 | 0.8 | MKP1848S52010JK2A | 11 | 99 |
| | 15 | 5 | 1.0 | MKP1848S55010JP*B | 13 | 70 |
| | | 7 | 1.0 | MKP1848S57010JP*B | 16.5 | 56 |
| | | 10 | 1.2 | MKP1848S61010JY*B | 21.5 | 40 |
| | | 15 | 1.2 | MKP1848S61510JY*B | 30 | 30 |
| | | 20 ⁽²⁾ | 1.2 | MKP1848S62010JY6B | 45 | 20 |
| | 18 | 3 | 1.0 | MKP1848S53010JP*C | 16.5 | 77 |
| | | 5 | 1.0 | MKP1848S55010JP*C | 16 | 70 |
| | | 7 | 1.0 | MKP1848S57010JP*C | 25.5 | 49 |
| | | 10 | 1.0 | MKP1848S61010JP*C | 21.5 | 49 |
| | | 15 | 1.2 | MKP1848S61510JY5C | 43.5 | 25 |
| | | 20 | 1.2 | MKP1848S62010JY5C | 43.5 | 25 |
| | 24 | 7 | 1.0 | MKP1848S57010JP*F | 25 | 63 |
| | | 10 | 1.0 | MKP1848S61010JP*F | 33 | 49 |
| | | 15 | 1.2 | MKP1848S61510JY*F | 45.5 | 40 |
| | | 20 | 1.2 | MKP1848S62010JY*F | 39 | 40 |
| | | 30 ⁽²⁾ | 1.2 | MKP1848S63010JY6F | 87 | 20 |

Notes

- (1) Intermediate capacitance values available on request
- (2) 6 pins
- (3) SPQ = Standard Packing Quantity

CONSTRUCTION DESCRIPTION

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.

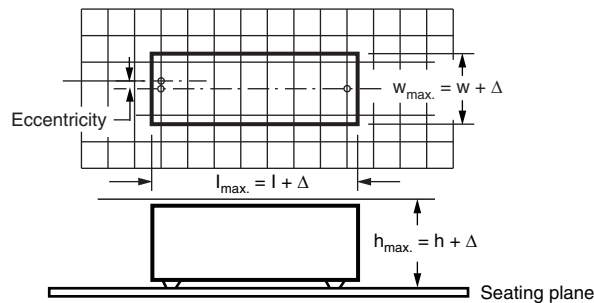
SPACE REQUIREMENTS ON PRINTED-CIRCUIT BOARD FOR 2 PINS PRODUCTS

The maximum space for length ($l_{max.}$), width ($w_{max.}$) and height ($h_{max.}$) of film capacitors to take in account on the printed circuit board is shown in the drawings.

For products with pitch = 37.5 mm, $\Delta = 0.7$ mm for l and w , and $\Delta = 0$ mm for h

For products with pitch = 52.5 mm, $\Delta = 1.0$ mm for l and w , and $\Delta = 0$ mm for h

Eccentricity defined as in drawing. The maximum eccentricity is smaller than or equal to the lead diameter of the product concerned.


SPACE REQUIREMENTS ON PRINTED-CIRCUIT BOARD FOR MULTIPLE PINS PRODUCTS

The product height with seating plane as given by "IEC 60717" as reference: $h_{max.} = h$. The maximum length and width of film capacitors is shown in the figure.

| DIMENSIONS in millimeters | | | | |
|---------------------------|-------------------|-------------------|-----|-----------|
| | | | | |
| P1 | L _{max.} | W _{max.} | Ø D | H |
| 37.5 | $l + 1.5$ | $w + 1.8$ | 1.5 | $h + 0.5$ |
| 52.5 | $l + 1.8$ | $w + 2.0$ | 1.7 | $h + 0.5$ |

SOLDERING CONDITIONS

For general soldering conditions and wave soldering profile we refer to the document "Soldering Conditions Vishay Film Capacitors": www.vishay.com/doc?28171

STORAGE TEMPERATURE

Storage temperature: $T_{stg} = -25\text{ °C to }+35\text{ °C}$ with RH maximum 75 % without condensation

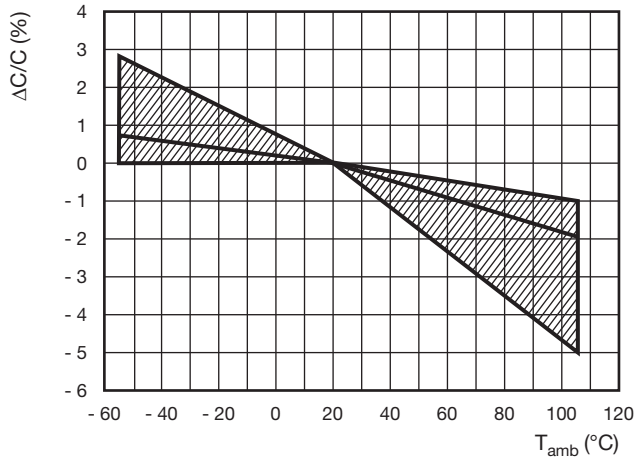
RATINGS AND CHARACTERISTICS REFERENCE CONDITIONS

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

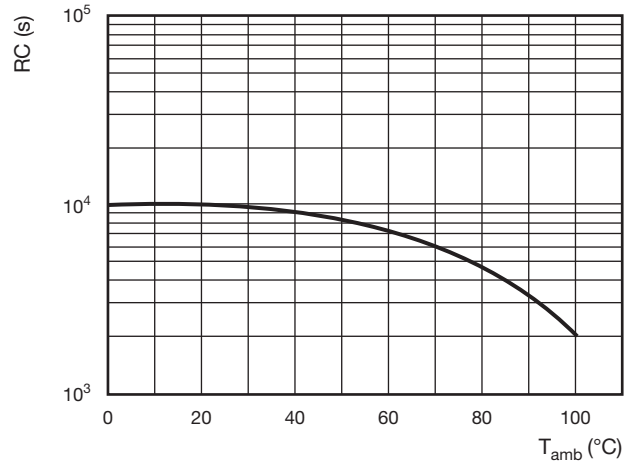
For reference testing, a conditioning period shall be applied over $96\text{ h} \pm 4\text{ h}$ by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.



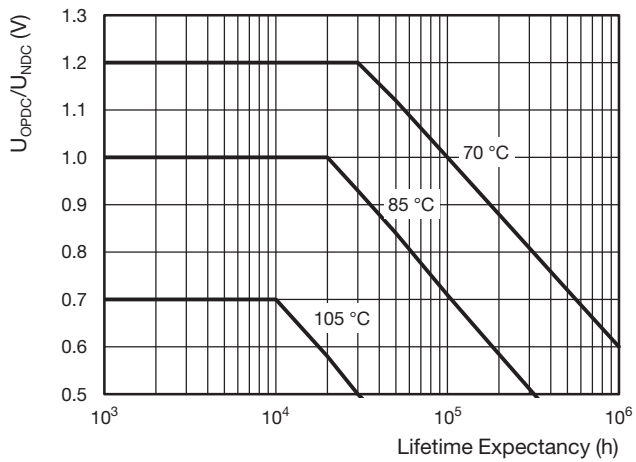
CHARACTERISTICS



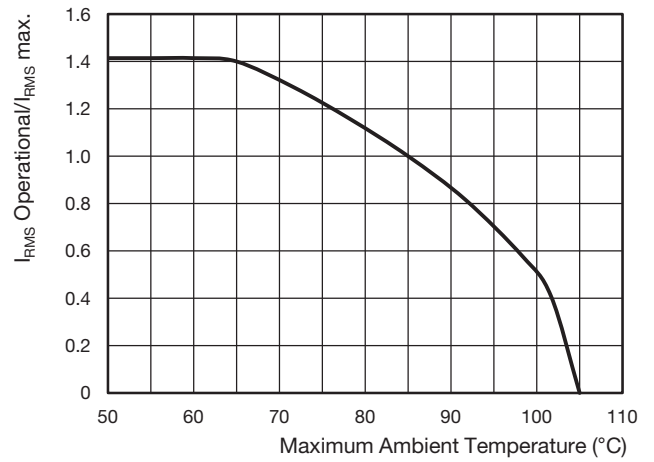
Capacitance as a function of ambient temperature (typical)



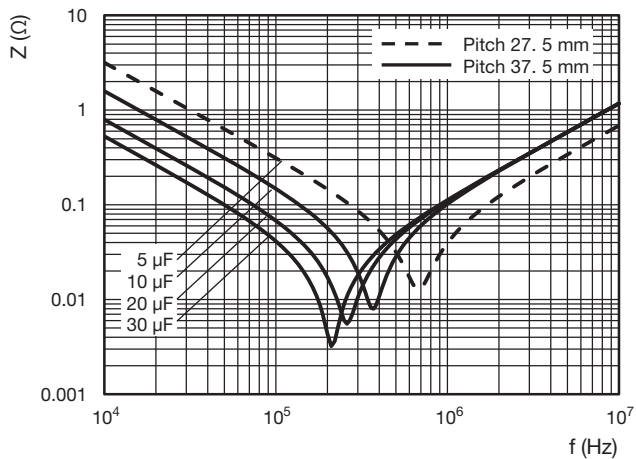
Insulation resistance as a function of ambient temperature (typical)



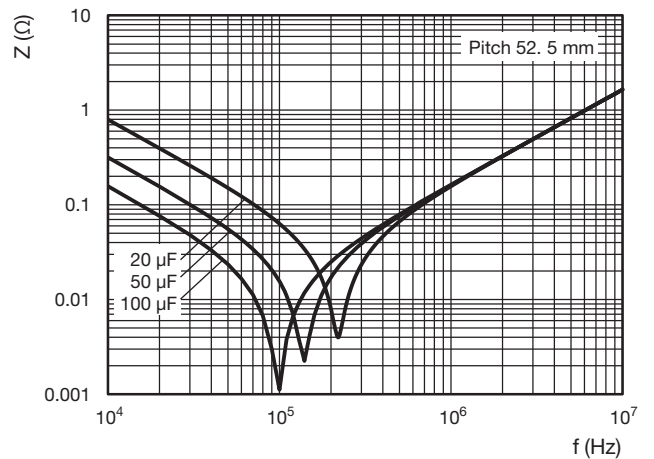
Lifetime expectancy (typical)



Maximum I_{RMS} current in function of ambient temperature



Impedance vs. Frequency (typical)



Impedance vs. Frequency (typical)

| HEAT CONDUCTIVITY | | | |
|--------------------------|----------|----------|----------------------------------|
| DIMENSION (mm) | | | HEAT CONDUCTIVITY (mW/°C) |
| w | h | l | |
| 24 | 12 | 31.5 | 21.5 |
| 27 | 15 | 31.5 | 26 |
| 27 | 15 | 42 | 33 |
| 33 | 15 | 42 | 38 |
| 24 | 18 | 42 | 33.5 |
| 27 | 18 | 42 | 36 |
| 39 | 18 | 42 | 47 |
| 30 | 24 | 42 | 45.5 |
| 39 | 24 | 42 | 54.5 |
| 33 | 15 | 57.5 | 48.5 |
| 45 | 15 | 57.5 | 61.5 |
| 62 | 15 | 57.5 | 80 |
| 35 | 18 | 57.5 | 55 |
| 50 | 18 | 57.5 | 72 |
| 39 | 24 | 57.5 | 68 |
| 70 | 24 | 57.5 | 106 |

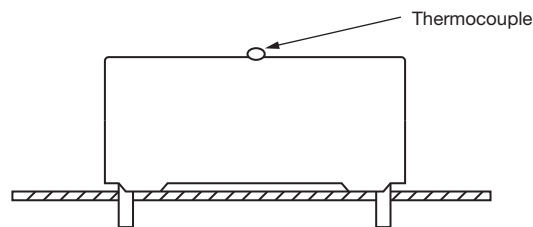
POWER DISSIPATION AND MAXIMUM COMPONENT TEMPERATURE RISE

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 (ΔT) can be measured or calculated by $\Delta T = P/G$:

- $\Delta T = T_{\text{case}} - T_{\text{ambient}} =$ Case temperature rise ($^{\circ}\text{C}$) with a maximum of 15°C at rated temperature.
- $P = I_{\text{RMS}}^2 \times \text{ESR} =$ Power dissipation of the component (mW)
- $G =$ Heat conductivity of the component (mW/ $^{\circ}\text{C}$)

MEASURING THE COMPONENT TEMPERATURE



The case temperature is measured in unloaded condition (T_{amb}) and loaded condition (T_{C}).

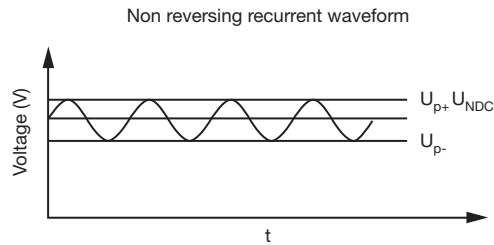
To avoid external thermal radiation or convection, the capacitor must be tested in a closed area, free from air circulation.

APPLICATION NOTES 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:

1. The continuous peak voltage (U_{p+}) shall not exceed the DC voltage rating (U_{NDC})
2. The peak-to-peak ripple voltage (U_{pp}) shall not be greater than $0.2 \times U_{NDC}$



3. For capacitors connected in parallel, normally the proof voltage and possibly the rated voltage must be reduced. For information depending of the capacitance value and the number of parallel connections contact dc-film@vishay.com.
4. The voltage peak slope (dU/dt) shall not exceed the 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

| MAXIMUM REPETITIVE PEAK VOLTAGES | |
|----------------------------------|--------------------------|
| REPETITIVE SURGE VOLTAGE | MAXIMUM DURATION PER DAY |
| $1.1 \times U_{NDC}$ | 30 % of on load duration |
| $1.15 \times U_{NDC}$ | 30 min |
| $1.2 \times U_{NDC}$ | 5 min |
| $1.3 \times U_{NDC}$ | 1 min |
| $1.5 \times U_{NDC}$ | 110 ms |

Note

- The capacitor unit may be subjected to the following surge without any significant reduction of lifetime expectancy



| INSPECTION REQUIREMENTS | | |
|--|---|---|
| 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 δ | 1 kHz at room temperature 10 kHz at room temperature | See specific reference data |
| 5.5.1-2 Voltage test between terminals | 1.5 x U _{NDC} at T _{amb} Duration: 10 s | No visible damage or puncture No flashover |
| 5.7 Insulation resistance | U _{NDC} ≤ 500 V measuring voltage 100 V at room temperature U _{NDC} > 500 V measuring voltage 500 V at room temperature 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 Dimensions: See specification drawing |
| 5.14.0 Initial measurements | Capacitance at 1 kHz tan δ at 10 kHz | |
| 5.14.1-1/4 Robustness of terminations IEC 60068-2-21 | Tensile U _{a1} Wire diameter Section modulus Load ≤ 0.8 mm ≤ 0.5 mm ² 10 N ≤ 1.25 mm ≤ 1.2 mm ² 20 N Duration: 10 s ± 1 s Bending, U _b method 1 Wire diameter Section modulus Load ≤ 0.8 mm ≤ 0.5 mm ² 10 N ≤ 1.25 mm ≤ 1.2 mm ² 20 N 4 x 90°, duration: 2 s to 3 s/bend | |
| 5.14.1-6 Resistance to soldering heat IEC 60068-2-20 | No pre-drying, method 1A Solder bath: 260 °C ± 5 °C Duration: 10 s ± 1 s | |
| 5.14.4 Final measurements | Capacitance tan δ | \Delta C/C ≤ 0.5 % Increase of tan δ ≤ 0.0050 compared to the values measured in 5.14.0 |
| 5.14.0 Initial measurements | Capacitance at 1 kHz tan δ 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 Test duration: 10 frequency cycles 3 axes offset from each other by 90° 1 octave/min Visual examination | No visible damage |



| INSPECTION REQUIREMENTS | | |
|--|--|---|
| SUB-CLAUSE NUMBER AND TEST | CONDITIONS | PERFORMANCE REQUIREMENTS |
| 5.14.3-2 Shock or impact IEC 60068-2-6 5.14.4 Final measurements | Pulse shape: half sine Acceleration: 490 m/s ² Duration of pulse: 11 ms Visual examination Capacitance tan δ | No visible damage $ \Delta C/C \leq 0.5\%$ Increase of tan δ ≤ 0.0050 compared to the values measured in 5.14.0 |
| 5.5.3-1 Initial measurements 5.5.3-2 Voltage test between terminals 5.5.3-3 Final measurements | Capacitance at 1 kHz tan δ at 10 kHz R insulation 1.5 x U _{NDC} at T _{amb} Duration: 60 s Capacitance tan δ R insulation | $ \Delta C/C \leq 0.5\%$ Increase of tan δ ≤ 0.0050 R insulation ≤ 50 % of specified values |
| 5.9-1 Initial measurements 5.9-2 Surge discharge test 5.9-2 Voltage test between terminals 5.9-3 Final measurements | Capacitance at 1 kHz tan δ at 10 kHz 1.1 x U _{NDC} Number of discharges: 5 Time lapse: every 2 min (10 min total) Within 5 min after the surge discharge test Duration: 60 s 1.5 x U _{NDC} at T _{amb} Capacitance tan δ at 10 kHz | $ \Delta C/C \leq 1.0\%$ tan δ ≤ 1.2 x initial tan δ + 0.0001 compared to the values measured in 5.9-1 |
| 5.11-1 Initial measurements 5.11-2 Self healing test 5.11-3 Final measurements | Capacitance at 1 kHz tan δ at 10 kHz 1.5 x U _{NDC} Duration: 10 s Number of clearings ≤ 5 Clearing = Voltage drop of 5 % increase the voltage at 100 V/s till 5 clearings occur with a max. of 2.5 x U _{NDC} for a duration of 10 s Capacitance tan δ | $ \Delta C/C \leq 0.5\%$ tan δ ≤ 1.2 x initial tan δ + 0.0001 compared to the values measured in 5.11-1 |



| INSPECTION REQUIREMENTS | | |
|--|---|---|
| SUB-CLAUSE NUMBER AND TEST | CONDITIONS | PERFORMANCE REQUIREMENTS |
| 5.13-0 Initial measurements 5.13-1 Change of temperature according to IEC 60682-2-14 5.13-2 Damp heat steady state according to IEC 60682-2-78 5.5.3-2 Voltage test between terminals 5.13-3 Final measurements | Capacitance at 1 kHz tan δ at 10 kHz Test Nb T _{max.} = 85 °C T _{min.} = - 40 °C Transition time: 1 h, equivalent to 1 °C/min 5 cycles Test Ca T _{max.} = 40 °C + 2 °C RH = 93 % ± 3 % Duration: 56 days 1.5 x U _{NDC} at ambient temperature Duration: 60 s Visual examination Capacitance tan δ at 1 V _{RMS} 10 kHz | No puncturing or flashover Self healing punctures are permitted $ \Delta C/C \leq 2.0 \%$ Increase of tan δ ≤ 0.0150 compared to the values measured in 5.13-0 |
| 5.10.0 Initial measurements 5.10-1 Thermal stability test under overload conditions 5.10-2 Final measurements | Capacitance at 1 kHz tan δ at 10 kHz Natural cooling T _{amb} ± 5 °C $1.21 \times P_{max.} = (U_2/2) \times W_2 \times C \times \tan \delta =$ $1.21 \times (I_{max.}^2/W_2 \times C) \times \tan \delta$ with $W_2 = 2 \times p \times f_2$ for I _{max.} (see specific reference data) f ₂ = 10 kHz Duration: 48 h Measure the temperature every 1.5 h during the last 6 h | Temperature rise ≤ 1 °C $ \Delta C/C \leq 2.0 \%$ Increase of tan δ ≤ 1.2 x initial δ + 0.0150 |
| 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 |



| INSPECTION REQUIREMENTS | | |
|---|--|---|
| SUB-CLAUSE NUMBER AND TEST | CONDITIONS | PERFORMANCE REQUIREMENTS |
| 5.15-0 Initial measurements 5.15-1 Endurance test between terminals 5.15-2 Final measurement | Capacitance at 1 kHz tan δ at 10 kHz Sequence: 1.3 x U _{NDC} at 85 °C 1.3 x U _{OPDC} at 105 °C Duration: 500 h 1000 x discharge at 1.4 x I _{peak} (maximum respective peak current in continuous operation) 1.3 x U _{NDC} at 85 °C 1.3 x U _{OPDC} at 105 °C Duration: 500 h | $ \Delta C/C \leq 3.0 \%$ Increase of tan $\delta \leq 0.0150$ compared to the values measured in 5.15-0 |
| 5.16.3-0 Initial measurements 5.16.3-1 Destruction test sequence High DC voltage test High AC voltage test 5.16.3-2 Final measurements | Capacitance at 1 kHz T _{max.} = 85 °C Product enveloped with cheese cloth 3 x U _{NDC} for DC voltage until repetitive product healings occur Duration = 15 min AC RMS voltage = U _{NDC} /2 $\sqrt{2}$ with minimum of 250 V _{AC} Duration = 5 min Repeat destruction sequence 3 x Visual examination | Audible healings or check healings with oscilloscope No puncturing, flashover or burning of the cheese cloth Self healing punctures are permitted |

Note

- Sub-clause numbers of tests and performance requirements refer to the “Sectional Specification, IEC-publication 61071”



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