

Low Building Height Metallized Polypropylene DC-Link Film Capacitor - Industrial Grade



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 μ F to 100 μ F |
| 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 \leq 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

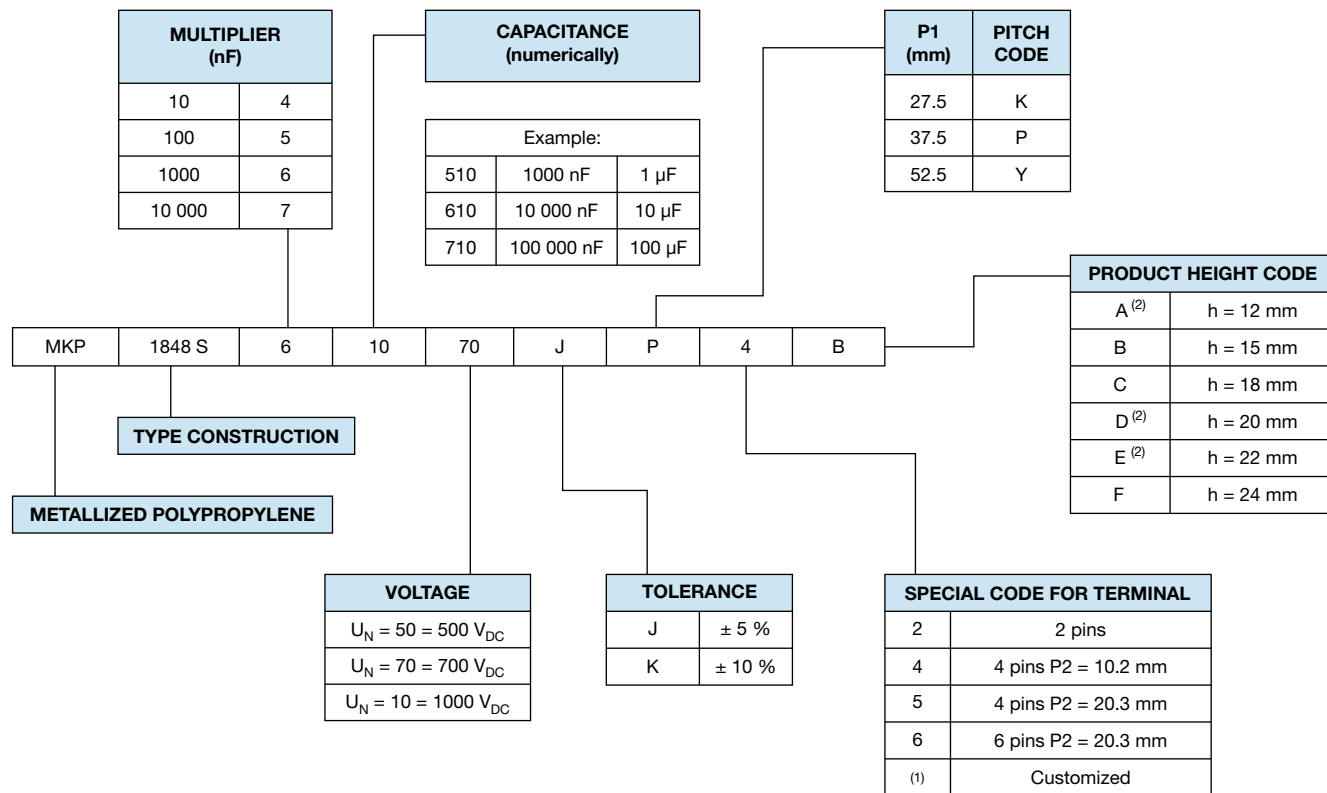
- For more detailed data and test requirements, contact dc-film@vishay.com
 - For general information like characteristics and definitions used for film capacitors follow the link: www.vishay.com/doc?28147
- ⁽¹⁾ See document "Voltage Proof Test for Metalized Capacitors" (www.vishay.com/doc?28169)

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 |

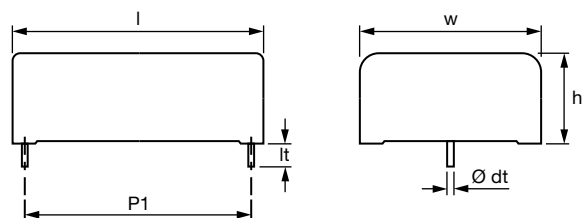


COMPOSITION OF CATALOG NUMBER

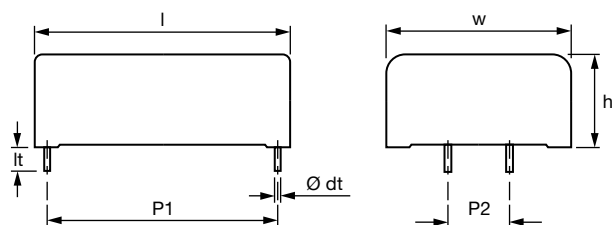
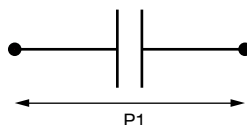


Notes

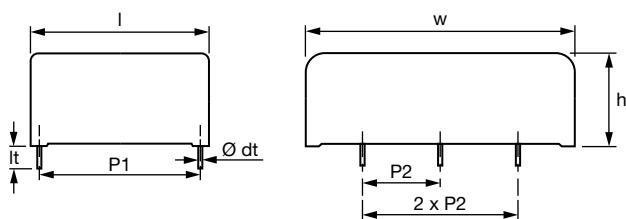
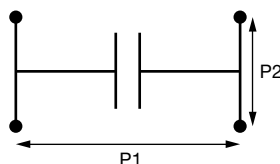
- (1) Tabs terminals or customized terminals are available on request
- (2) Product height on request

DIMENSIONS in millimeters


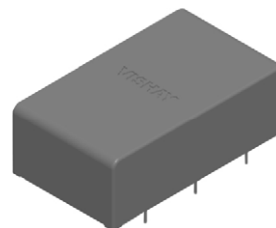
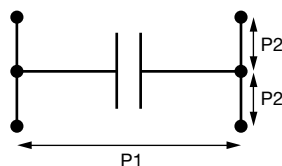
$P1 \pm 0.5 \text{ mm}$
 $lt = 6 \text{ mm} + 0 \text{ mm} / - 1 \text{ mm}$



$P1 \text{ and } P2 \pm 0.5 \text{ mm}$
 $lt = 6 \text{ mm} + 0 \text{ mm} / - 2 \text{ mm}$



$P1 \text{ and } P2 \pm 0.5 \text{ mm}$
 $lt = 6 \text{ mm} + 0 \text{ mm} / - 2 \text{ mm}$


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 $\leq \pm 5 \%$
 (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

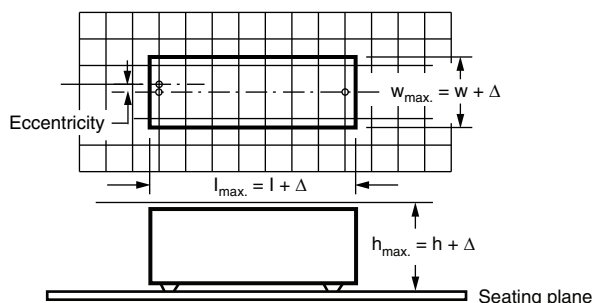
The capacitor unit is designed for mounting on a printed circuit board. In order to withstand vibration and shock tests, it must be insured that the stand-off pins are in good contact with the printed circuit board. The capacitors shall be mechanically fixed by the leads and the body clamped.

SPACE REQUIREMENTS ON PRINTED-CIRCUIT BOARD FOR 2 PINS PRODUCTS

For the maximum product dimensions and maximum space requirements for length ($l_{max.}$), width ($w_{max.}$) and height ($h_{max.}$) following tolerances must be taken in account in the envelopment of the components as shown in the drawings below.

- For products with pitch = 27.5 mm, $\Delta l = \Delta l = 0.5$ mm, and $\Delta h = 0.5$ mm
- For products with pitch = 37.5 mm, $\Delta w = \Delta l = 0.7$ mm and, $\Delta h = 0.5$ mm
- For products with pitch = 52.5 mm, $\Delta w = \Delta l = 1.0$ mm and, $\Delta h = 0.5$ mm

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



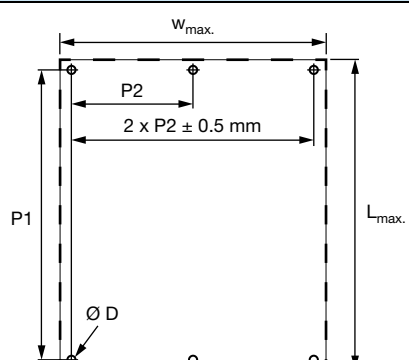
For the minimum product dimensions for length ($l_{min.}$), width ($w_{min.}$) and height ($h_{min.}$) following tolerances of the components are valid:

$$l_{min.} = l - \Delta l, w_{min.} = w - \Delta w \text{ and } h_{min.} = h - \Delta h$$

- For products with pitch = 27.5 mm, $\Delta l = 1.0$ mm and $\Delta w = \Delta h = 0.5$ mm
- For products with pitch = 37.5 mm, $\Delta l = 1.0$ mm and $\Delta w = \Delta h = 1.0$ mm
- For products with pitch = 52.5 mm, $\Delta l = 1.5$ mm and $\Delta w = \Delta h = 1.0$ mm

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 | $l_{max.}$ | $w_{max.}$ | $\varnothing D$ | 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

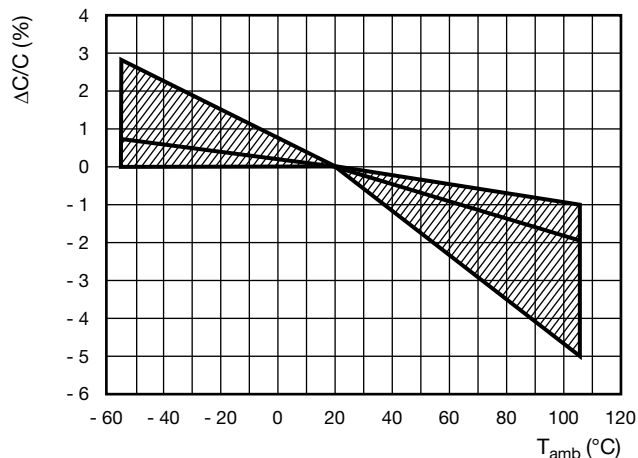
STORAGE TEMPERATURE

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

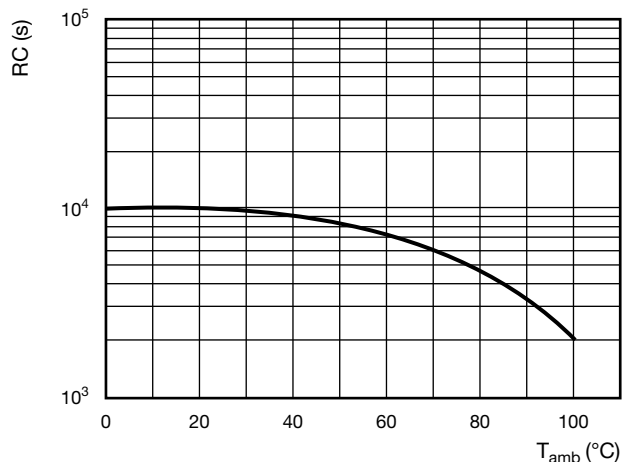
RATINGS AND CHARACTERISTICS REFERENCE CONDITIONS

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 $50\% \pm 2\%$.

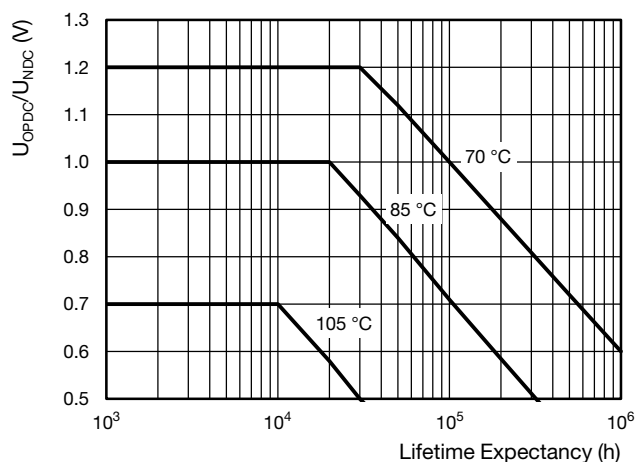
For reference testing, a conditioning period shall be applied over $96\text{ h} \pm 4\text{ h}$ by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

CHARACTERISTICS


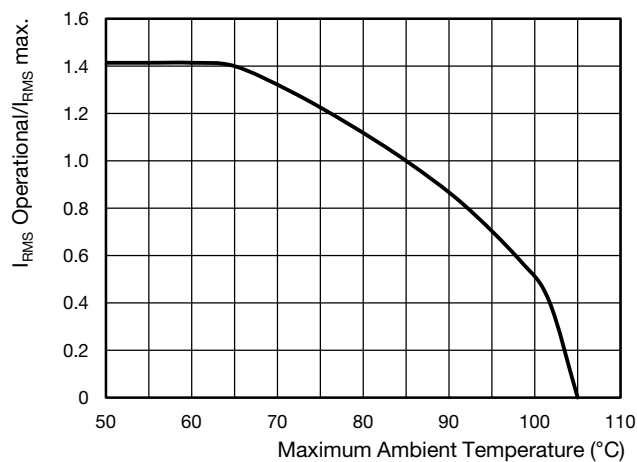
Capacitance as a function of ambient temperature (typical)



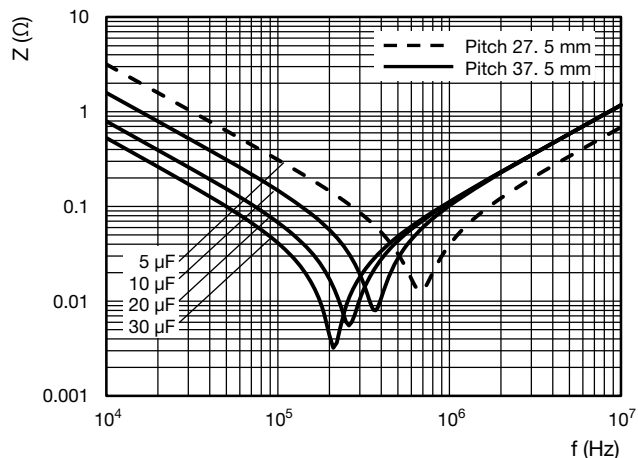
Insulation resistance as a function of ambient temperature (typical)



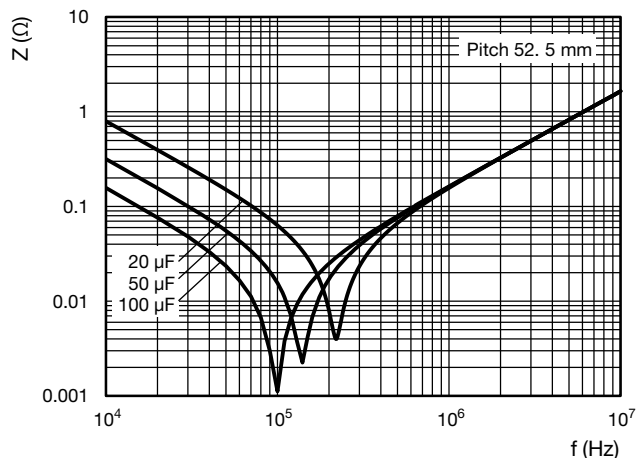
Lifetime expectancy (typical)



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 |

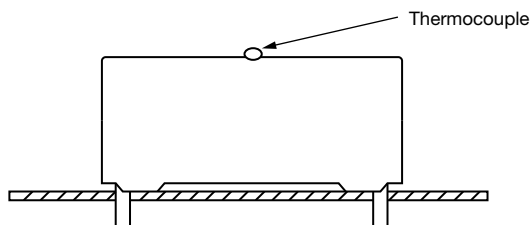
POWER DISSIPATION AND MAXIMUM COMPONENT TEMPERATURE RISE

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 $\Delta T = P/G$:

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

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.

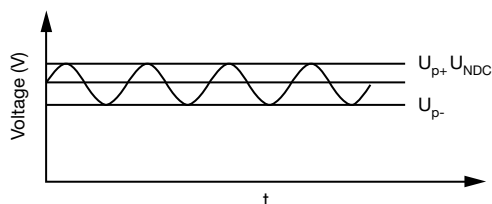
APPLICATION NOTES AND LIMITING CONDITIONS

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 $0.2 \times U_{NDC}$

Non reversing recurrent waveform



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 | $U_{NDC} \leq 500$ 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 \pm 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 \pm 5 °C Duration: 10 s \pm 1 s | |
| 5.14.4 Final measurements | Capacitance tan δ | $ \Delta C/C \leq 0.5$ % Increase of tan $\delta \leq 0.0050$ 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 \pm 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 $\delta \leq 0.0050$ 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 $\delta \leq 0.0050$ R insulation $\leq 50 \%$ 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 $\delta \leq 1.2 \times \text{initial tan } \delta + 0.0001$ 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 $\delta \leq 1.2 \times \text{initial tan } \delta + 0.0001$ 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 $T_{max.} = 85\text{ }^{\circ}\text{C}$ $T_{min.} = -40\text{ }^{\circ}\text{C}$ Transition time: 1 h, equivalent to 1 $^{\circ}\text{C}/\text{min}$ 5 cycles Test Ca $T_{max.} = 40\text{ }^{\circ}\text{C} + 2\text{ }^{\circ}\text{C}$ $RH = 93\% \pm 3\%$ 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 $\delta \leq 0.0150$ 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 $T_{amb} \pm 5\text{ }^{\circ}\text{C}$ $1.21 \times P_{max.} = (U_2/2) \times W_2 \times C \times \tan \delta =$ $1.21 \times (I_{max.}^2 / W_2 \times C) \times \tan \delta$ with $W_2 = 2 \times p \times f_2$ for $I_{max.}$ (see specific reference data) $f_2 = 10\text{ kHz}$ Duration: 48 h Measure the temperature every 1.5 h during the last 6 h | Temperature rise $\leq 1\text{ }^{\circ}\text{C}$ $ \Delta C/C \leq 2.0\%$ Increase of tan $\delta \leq 1.2 \times \text{initial } \delta + 0.0150$ |
| 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 | Capacitance at 1 kHz tan δ at 10 kHz | |
| 5.15-1 Endurance test between terminals | 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 | |
| 5.15-2 Final measurement | Capacitance tan δ | ΔC/C ≤ 3.0 % Increase of tan δ ≤ 0.0150 compared to the values measured in 5.15-0 |
| 5.16.3-0 Initial measurements | Capacitance at 1 kHz | |
| 5.16.3-1 Desctruction test sequence High DC voltage test | T _{max.} = 85 °C Product enveloped with cheese cloth 3 x U _{NDC} for DC voltage until repetitive product healings occur Duration = 15 min | Audible healings or check healings with oscilloscope |
| High AC voltage test | AC RMS voltage = U _{NDC} /2 √2 with minimum of 250 V _{AC} Duration = 5 min Repeat destruction sequence 3 x | |
| 5.16.3-2 Final measurements | Visual examination | 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”



Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Vishay products are not designed for use in life-saving or life-sustaining applications or any application in which the failure of the Vishay product could result in personal injury or death unless specifically qualified in writing by Vishay. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.