

## THB DC-Link Metallized Polypropylene Film Capacitor Radial Type 85 °C / 85 % RH 1000 h at U<sub>NDC</sub>


**FEATURES**

- High robustness under high humidity
- THB 85 °C, 85 % RH, 1000 h at rated U<sub>NDC</sub>
- AEC-Q200 qualified, revision D at T<sub>max.</sub> 85 °C (T<sub>max.</sub> = 105 °C available on request)
- High ripple current capability, low ESR, low ESL
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

 AUTOMOTIVE  
GRADE

**RoHS**  
COMPLIANT

 HALOGEN  
**FREE**
**GREEN**  
(5-2008)

**APPLICATIONS**

- Ideal for out-of-doors applications or in other harsh environments
- Renewable energies inverters
- UPS
- Battery chargers
- Motor drives

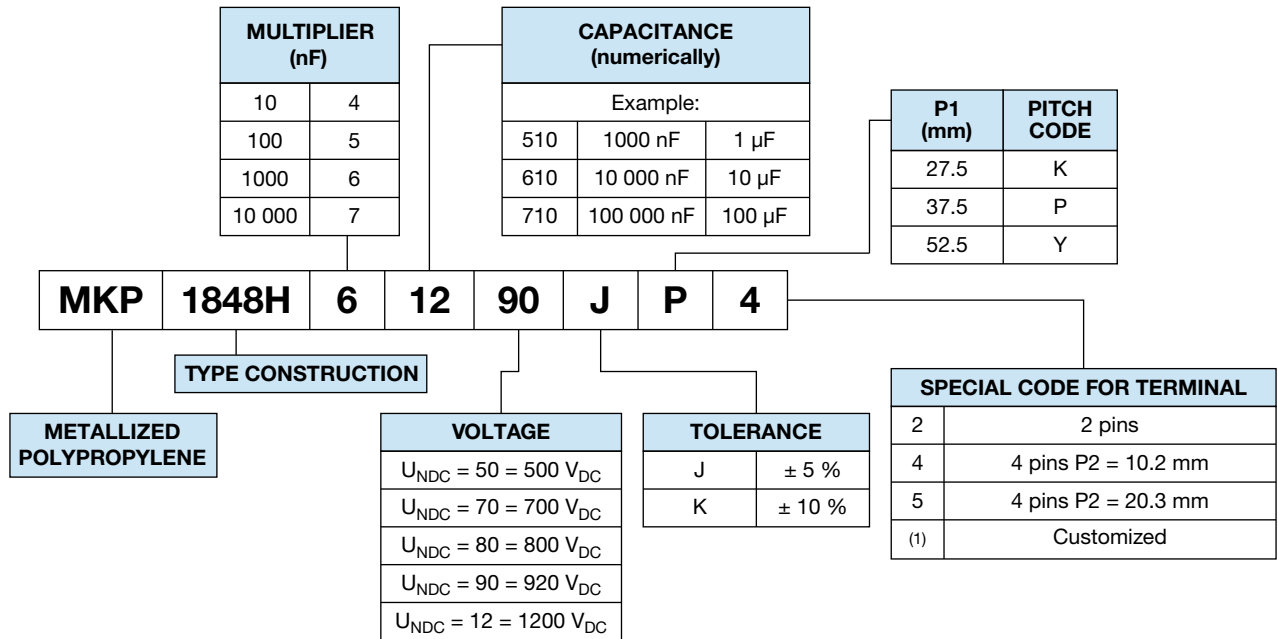
| QUICK REFERENCE DATA                                     |   |
|--|---|
| Rated capacitance range                                  | 1 µF to 80 µF   |
| Capacitance tolerance                                    | ± 5 %, ± 10 %   |
| Climatic testing class                                   | 40 / 085 / 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 <sub>NDC</sub>  |
| Reference standards                                      | IEC 61071, IEC 60068  |
| Dielectric   | Polypropylene film  |
| Electrodes   | Metallized dielectric capacitor   |
| Construction   | Mono construction   |
| Encapsulation  | Plastic case sealed with resin; flame retardant UL 94 V-0   |
| Terminals  | Tinned wire   |
| Self inductance (L <sub>s</sub> )                        | < 1 nH per mm of lead spacing   |
| Withstanding DC voltage between terminals <sup>(1)</sup> | 1.5 U <sub>NDC</sub> for 10 s, cut off current 10 mA, rise time ≤ 1000 V/s  |
| Insulation resistance                                    | RC between leads, after 1 min > 10 000 s, measuring voltage: 500 V  |
| Life time expectancy <sup>(2)</sup>                      | Useful life time: > 100 000 h at U <sub>NDC</sub> and 70 °C<br>FIT: < 10 x 10 <sup>-9</sup> /h (10 per 10 <sup>9</sup> component h) at 0.5 x U <sub>NDC</sub> , 40 °C |
| Marking  | Manufacturer's name; C-value; tolerance; rated voltage; manufacturer's type designation; code for dielectric material, manufacturer location, year and week           |

**Notes**

- For more detailed data and test requirements, contact [dc-film@vishay.com](mailto:dc-film@vishay.com)
- For general information like characteristics and definitions used for film capacitors follow the link: [www.vishay.com/doc?28147](http://www.vishay.com/doc?28147)
- <sup>(1)</sup> See document "Voltage Proof Test for Metallized Film Capacitors" ([www.vishay.com/doc?28169](http://www.vishay.com/doc?28169))
- <sup>(2)</sup> Statements about life time results from calculations which are based on internal tests. They have to be understood exclusively as estimations. Also due to external factors, the life time in the field application may deviate from the calculated life time

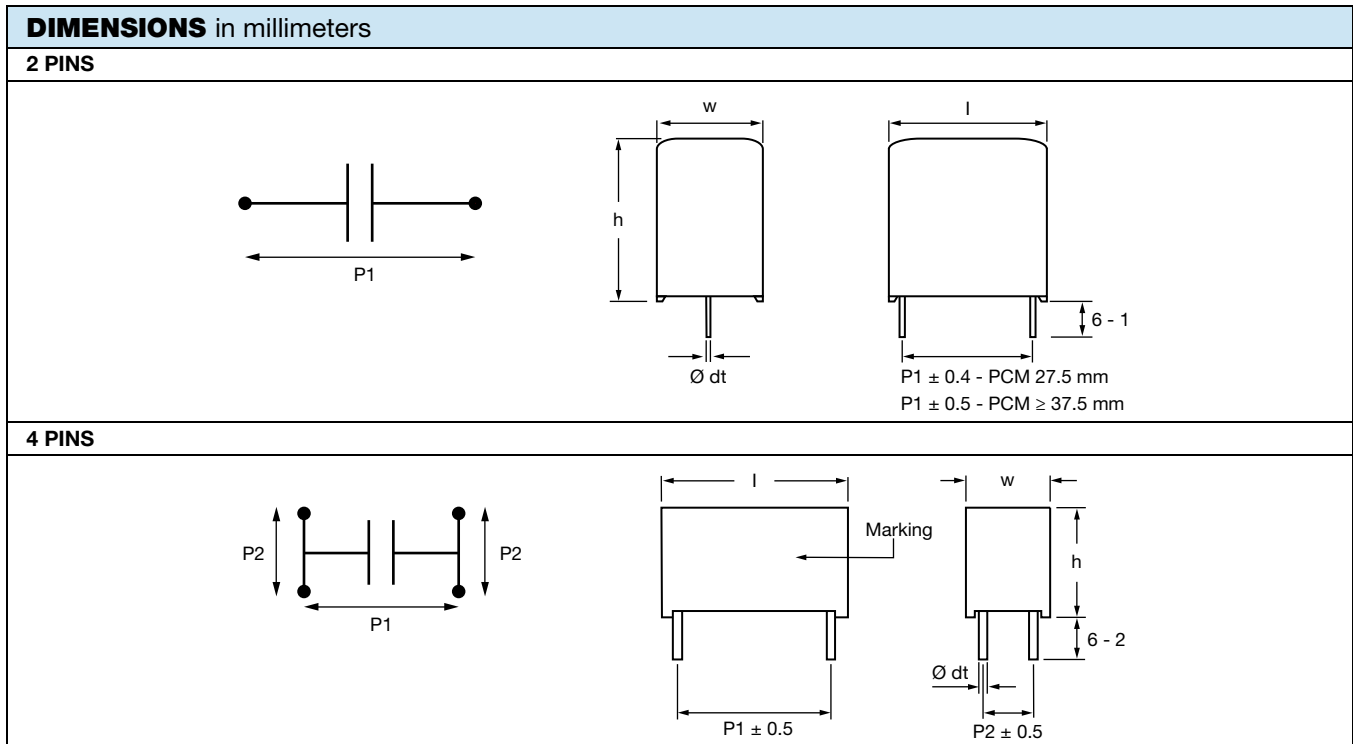
| DC VOLTAGE RATINGS          |       |       |       |        |        |
|-----------------------------|-------|-------|-------|--------|--------|
| U <sub>NDC</sub> at 85 °C   | 500 V | 700 V | 800 V | 920 V  | 1200 V |
| U <sub>OPDC</sub> at 70 °C  | 600 V | 800 V | 960 V | 1100 V | 1440 V |
| U <sub>OPDC</sub> at 105 °C | 350 V | 450 V | 560 V | 650 V  | 850 V  |

## COMPOSITION OF CATALOG NUMBER



**Note**

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



**Note**

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



| ELECTRICAL DATA AND ORDERING CODE      |   |   |      |      |            |             |                 |                          |                             |           |                           |           |  |                  |                   |
|--|---|---|------|------|------------|-------------|-----------------|--------------------------|-----------------------------|-----------|---------------------------|-----------|--|------------------|-------------------|
| U <sub>NDc</sub><br>AT<br>85 °C<br>(V) | CAP.<br>(μF)  | DIMENSION (5)<br>(mm)   |      |      | P1<br>(mm) | P2<br>(mm)  | du/dt<br>(V/μs) | I <sub>PEAK</sub><br>(A) | I <sub>RMS</sub> (2)<br>(A) |           | ESR (3)<br>10 kHz<br>(mΩ) |           | tan δ (4)<br>10 kHz<br>< (x 10 <sup>-4</sup> ) |                  | ORDERING CODE (1) |
|  |   | w   | h    | l    |            |             |                 |                          | 2<br>PINS                   | 4<br>PINS | 2<br>PINS                 | 4<br>PINS | 2<br>PINS                                      | 4<br>PINS        |                   |
|  |   | U <sub>OPDC</sub> AT 70 °C = 600 V; U <sub>OPDC</sub> AT 105 °C = 350 V |      |      |            |             |                 |                          |                             |           |                           |           |  |                  |                   |
| 500                                    | 5   | 15.0  | 25.0 | 32.0 | 27.5       | -           | 40              | 200                      | 7.0                         | -         | 10.1                      | -         | 65   | -                | MKP1848H55050+K2  |
|  | 6   | 15.0  | 25.0 | 32.0 | 27.5       | -           | 40              | 240                      | 7.6                         | -         | 8.6                       | -         | 65   | -                | MKP1848H56050+K2  |
|  | 7   | 18.0  | 28.0 | 32.0 | 27.5       | -           | 40              | 280                      | 8.8                         | -         | 7.6                       | -         | 65   | -                | MKP1848H57050+K2  |
|  | 8   | 18.0  | 28.0 | 32.0 | 27.5       | -           | 40              | 320                      | 9.3                         | -         | 6.8                       | -         | 65   | -                | MKP1848H58050+K2  |
|  | 10  | 21.0  | 31.0 | 32.0 | 27.5       | -           | 40              | 400                      | 11.0                        | -         | 5.7                       | -         | 65   | -                | MKP1848H61050+K2  |
|  | 12  | 21.0  | 31.0 | 32.0 | 27.5       | -           | 40              | 480                      | 11.7                        | -         | 5.0                       | -         | 65   | -                | MKP1848H61250+K2  |
|  | 15  | 22.0  | 38.0 | 32.0 | 27.5       | -           | 40              | 600                      | 13.9                        | -         | 4.3                       | -         | 65   | -                | MKP1848H61550+K2  |
|  | 20  | 21.5  | 38.5 | 42.0 | 37.5       | 10.2        | 20              | 400                      | 13.6                        | 14.4      | 5.3                       | 4.8       | 145  | 130              | MKP1848H62050+P*  |
|  | 22  | 21.5  | 38.5 | 42.0 | 37.5       | 10.2        | 20              | 440                      | 14.1                        | 14.8      | 5.0                       | 4.5       | 145  | 130              | MKP1848H62250+P*  |
|  | 25  | 21.5  | 38.5 | 42.0 | 37.5       | 10.2        | 20              | 500                      | 14.7                        | 15.5      | 4.6                       | 4.1       | 145  | 130              | MKP1848H62550+P*  |
|  | 30  | 30.0  | 45.0 | 42.0 | 37.5       | 10.2 / 20.3 | 20              | 600                      | 18.1                        | 19.1      | 4.1                       | 3.7       | 145  | 130              | MKP1848H63050+P*  |
|  | 35  | 30.0  | 45.0 | 42.0 | 37.5       | 10.2 / 20.3 | 20              | 700                      | 18.9                        | 19.9      | 3.8                       | 3.4       | 145  | 130              | MKP1848H63550+P*  |
|  | 40  | 30.0  | 45.0 | 42.0 | 37.5       | 10.2 / 20.3 | 20              | 800                      | 19.6                        | 20.7      | 3.5                       | 3.2       | 145  | 130              | MKP1848H64050+P*  |
|  | 45  | 30.0  | 45.0 | 42.0 | 37.5       | 10.2 / 20.3 | 20              | 900                      | 20.2                        | 21.3      | 3.3                       | 3.0       | 145  | 130              | MKP1848H64550+P*  |
|  | 50  | 30.0  | 45.0 | 57.5 | 52.5       | 20.3        | 10              | 500                      | 20.9                        | 22.0      | 3.9                       | 3.5       | 250  | 225              | MKP1848H65050+Y*  |
|  | 55  | 30.0  | 45.0 | 57.5 | 52.5       | 20.3        | 10              | 550                      | 21.2                        | 22.3      | 3.8                       | 3.4       | 250  | 225              | MKP1848H65550+Y*  |
|  | 60  | 30.0  | 45.0 | 57.5 | 52.5       | 20.3        | 10              | 600                      | 21.4                        | 22.5      | 3.7                       | 3.3       | 250  | 225              | MKP1848H66050+Y*  |
| 65                                     | 30.0  | 45.0  | 57.5 | 52.5 | 20.3       | 10          | 650             | 21.6                     | 22.7                        | 3.6       | 3.3                       | 250       | 225  | MKP1848H66550+Y* |                   |
| 70                                     | 35.0  | 50.0  | 57.5 | 52.5 | 20.3       | 10          | 700             | 23.5                     | 24.8                        | 3.6       | 3.2                       | 250       | 225  | MKP1848H67050+Y* |                   |
| 75                                     | 35.0  | 50.0  | 57.5 | 52.5 | 20.3       | 10          | 750             | 23.6                     | 24.9                        | 3.5       | 3.2                       | 250       | 225  | MKP1848H67550+Y* |                   |
| 80                                     | 35.0  | 50.0  | 57.5 | 52.5 | 20.3       | 10          | 800             | 23.8                     | 25.1                        | 3.5       | 3.2                       | 250       | 225  | MKP1848H68050+Y* |                   |
| 700                                    | U <sub>OPDC</sub> AT 70 °C = 800 V; U <sub>OPDC</sub> AT 105 °C = 450 V |   |      |      |            |             |                 |                          |                             |           |                           |           |  |                  |                   |
|  | 4   | 15.0  | 25.0 | 32.0 | 27.5       | -           | 50              | 200                      | 7.0                         | -         | 10.0                      | -         | 55   | -                | MKP1848H54070+K2  |
|  | 5   | 18.0  | 28.0 | 32.0 | 27.5       | -           | 50              | 250                      | 8.4                         | -         | 8.2                       | -         | 55   | -                | MKP1848H55070+K2  |
|  | 6   | 18.0  | 28.0 | 32.0 | 27.5       | -           | 50              | 300                      | 9.1                         | -         | 7.0                       | -         | 55   | -                | MKP1848H56070+K2  |
|  | 7   | 21.0  | 31.0 | 32.0 | 27.5       | -           | 50              | 350                      | 10.6                        | -         | 6.2                       | -         | 55   | -                | MKP1848H57070+K2  |
|  | 8   | 21.0  | 31.0 | 32.0 | 27.5       | -           | 50              | 400                      | 11.1                        | -         | 5.6                       | -         | 55   | -                | MKP1848H58070+K2  |
|  | 10  | 22.0  | 38.0 | 32.0 | 27.5       | -           | 50              | 500                      | 13.3                        | -         | 4.7                       | -         | 55   | -                | MKP1848H61070+K2  |
|  | 12  | 22.0  | 38.0 | 32.0 | 27.5       | -           | 50              | 600                      | 14.2                        | -         | 4.1                       | -         | 55   | -                | MKP1848H61270+K2  |
|  | 15  | 21.5  | 38.5 | 42.0 | 37.5       | 10.2        | 25              | 375                      | 14.6                        | 15.3      | 4.7                       | 4.2       | 100  | 90               | MKP1848H61570+P*  |
|  | 20  | 21.5  | 38.5 | 42.0 | 37.5       | 10.2        | 25              | 500                      | 15.6                        | 16.5      | 4.0                       | 3.6       | 100  | 90               | MKP1848H62070+P*  |
|  | 22  | 30.0  | 45.0 | 42.0 | 37.5       | 10.2 / 20.3 | 25              | 550                      | 18.7                        | 19.7      | 3.9                       | 3.5       | 100  | 90               | MKP1848H62270+P*  |
|  | 25  | 30.0  | 45.0 | 42.0 | 37.5       | 10.2 / 20.3 | 25              | 625                      | 19.2                        | 20.2      | 3.7                       | 3.3       | 100  | 90               | MKP1848H62570+P*  |
|  | 30  | 30.0  | 45.0 | 42.0 | 37.5       | 10.2 / 20.3 | 25              | 750                      | 19.9                        | 21.0      | 3.4                       | 3.1       | 100  | 90               | MKP1848H63070+P*  |
|  | 35  | 30.0  | 45.0 | 57.5 | 52.5       | 20.3        | 12              | 420                      | 19.7                        | 20.8      | 4.3                       | 3.9       | 215  | 195              | MKP1848H63570+Y*  |
|  | 40  | 30.0  | 45.0 | 57.5 | 52.5       | 20.3        | 12              | 480                      | 20.1                        | 21.2      | 4.2                       | 3.8       | 215  | 195              | MKP1848H64070+Y*  |
| 45                                     | 30.0  | 45.0  | 57.5 | 52.5 | 20.3       | 12          | 540             | 20.5                     | 21.6                        | 4.0       | 3.6                       | 215       | 195  | MKP1848H64570+Y* |                   |
| 50                                     | 35.0  | 50.0  | 57.5 | 52.5 | 20.3       | 12          | 600             | 22.4                     | 23.6                        | 3.9       | 3.5                       | 215       | 195  | MKP1848H65070+Y* |                   |
| 55                                     | 35.0  | 50.0  | 57.5 | 52.5 | 20.3       | 12          | 660             | 22.7                     | 23.9                        | 3.9       | 3.5                       | 215       | 195  | MKP1848H65570+Y* |                   |
| 60                                     | 35.0  | 50.0  | 57.5 | 52.5 | 20.3       | 12          | 720             | 22.9                     | 24.1                        | 3.8       | 3.4                       | 215       | 195  | MKP1848H66070+Y* |                   |



| ELECTRICAL DATA AND ORDERING CODE  |           |   |      |      |         |             |              |                       |                          |        |                     |        |  |                  |                   |
|--|-----------|---|------|------|---------|-------------|--------------|-----------------------|--------------------------|--------|---------------------|--------|--|------------------|-------------------|
| U <sub>NDc</sub> AT 85 °C (V)  | CAP. (µF) | DIMENSION (5) (mm)  |      |      | P1 (mm) | P2 (mm)     | du/dt (V/µs) | I <sub>PEAK</sub> (A) | I <sub>RMS</sub> (2) (A) |        | ESR (3) 10 kHz (mΩ) |        | tan δ (4) 10 kHz < (x 10 <sup>-4</sup> ) |                  | ORDERING CODE (1) |
|  |           | w   | h    | l    |         |             |              |                       | 2 PINS                   | 4 PINS | 2 PINS              | 4 PINS | 2 PINS                                   | 4 PINS           |                   |
|  |           | U <sub>OPDC</sub> AT 70 °C = 960 V; U <sub>OPDC</sub> AT 105 °C = 560 V |      |      |         |             |              |                       |                          |        |                     |        |  |                  |                   |
| 800  | 3         | 15.0  | 25.0 | 32.0 | 27.5    | -           | 60           | 180                   | 6.3                      | -      | 12.3                | -      | 50                                       | -                | MKP1848H53080+K2  |
|  | 4         | 18.0  | 28.0 | 32.0 | 27.5    | -           | 60           | 240                   | 7.7                      | -      | 9.8                 | -      | 50                                       | -                | MKP1848H54080+K2  |
|  | 5         | 21.0  | 31.0 | 32.0 | 27.5    | -           | 60           | 300                   | 9.1                      | -      | 8.4                 | -      | 50                                       | -                | MKP1848H55080+K2  |
|  | 6         | 21.0  | 31.0 | 32.0 | 27.5    | -           | 60           | 360                   | 9.7                      | -      | 7.4                 | -      | 50                                       | -                | MKP1848H56080+K2  |
|  | 7         | 21.0  | 31.0 | 32.0 | 27.5    | -           | 60           | 420                   | 10.1                     | -      | 6.7                 | -      | 50                                       | -                | MKP1848H57080+K2  |
|  | 8         | 22.0  | 38.0 | 32.0 | 27.5    | -           | 60           | 480                   | 11.6                     | -      | 6.2                 | -      | 50                                       | -                | MKP1848H58080+K2  |
|  | 10        | 22.0  | 38.0 | 32.0 | 27.5    | -           | 60           | 600                   | 12.3                     | -      | 5.4                 | -      | 50                                       | -                | MKP1848H61080+K2  |
|  | 12        | 21.5  | 38.5 | 42.0 | 37.5    | 10.2        | 30           | 360                   | 11.8                     | 12.5   | 7.1                 | 6.4    | 100                                      | 90               | MKP1848H61280+P*  |
|  | 15        | 21.5  | 38.5 | 42.0 | 37.5    | 10.2        | 30           | 450                   | 12.8                     | 13.5   | 6.1                 | 5.5    | 100                                      | 90               | MKP1848H61580+P*  |
|  | 20        | 30.0  | 45.0 | 42.0 | 37.5    | 10.2 / 20.3 | 30           | 600                   | 16.3                     | 17.2   | 5.1                 | 4.6    | 100                                      | 90               | MKP1848H62080+P*  |
|  | 22        | 30.0  | 45.0 | 42.0 | 37.5    | 10.2 / 20.3 | 30           | 660                   | 16.8                     | 17.7   | 4.8                 | 4.3    | 100                                      | 90               | MKP1848H62280+P*  |
|  | 25        | 30.0  | 45.0 | 42.0 | 37.5    | 10.2 / 20.3 | 30           | 750                   | 17.4                     | 18.3   | 4.5                 | 4.0    | 100                                      | 90               | MKP1848H62580+P*  |
|  | 30        | 30.0  | 45.0 | 57.5 | 52.5    | 20.3        | 15           | 450                   | 17.4                     | 18.3   | 5.6                 | 5.0    | 210                                      | 190              | MKP1848H63080+Y*  |
|  | 35        | 30.0  | 45.0 | 57.5 | 52.5    | 20.3        | 15           | 525                   | 18.3                     | 19.3   | 5.0                 | 4.5    | 210                                      | 190              | MKP1848H63580+Y*  |
|  | 40        | 35.0  | 50.0 | 57.5 | 52.5    | 20.3        | 15           | 600                   | 20.7                     | 21.8   | 4.6                 | 4.2    | 210                                      | 190              | MKP1848H64080+Y*  |
| 45   | 35.0      | 50.0  | 57.5 | 52.5 | 20.3    | 15          | 675          | 21.5                  | 22.7                     | 4.3    | 3.9                 | 210    | 190                                      | MKP1848H64580+Y* |                   |
| 50   | 35.0      | 50.0  | 57.5 | 52.5 | 20.3    | 15          | 750          | 22.2                  | 23.4                     | 4.0    | 3.6                 | 210    | 190                                      | MKP1848H65080+Y* |                   |
| U <sub>OPDC</sub> AT 70 °C = 1100 V; U <sub>OPDC</sub> AT 105 °C = 650 V |           |   |      |      |         |             |              |                       |                          |        |                     |        |  |                  |                   |
| 920  | 2         | 15.0  | 25.0 | 32.0 | 27.5    | -           | 65           | 130                   | 5.7                      | -      | 15.2                | -      | 40                                       | -                | MKP1848H52090+K2  |
|  | 3         | 18.0  | 28.0 | 32.0 | 27.5    | -           | 65           | 195                   | 7.4                      | -      | 10.8                | -      | 40                                       | -                | MKP1848H53090+K2  |
|  | 4         | 18.0  | 28.0 | 32.0 | 27.5    | -           | 65           | 260                   | 8.3                      | -      | 8.5                 | -      | 40                                       | -                | MKP1848H54090+K2  |
|  | 5         | 21.0  | 31.0 | 32.0 | 27.5    | -           | 65           | 325                   | 9.8                      | -      | 7.2                 | -      | 40                                       | -                | MKP1848H55090+K2  |
|  | 6         | 22.0  | 38.0 | 32.0 | 27.5    | -           | 65           | 390                   | 11.5                     | -      | 6.3                 | -      | 40                                       | -                | MKP1848H56090+K2  |
|  | 7         | 22.0  | 38.0 | 32.0 | 27.5    | -           | 65           | 455                   | 12.1                     | -      | 5.6                 | -      | 40                                       | -                | MKP1848H57090+K2  |
|  | 8         | 22.0  | 38.0 | 32.0 | 27.5    | -           | 65           | 520                   | 12.6                     | -      | 5.2                 | -      | 40                                       | -                | MKP1848H58090+K2  |
|  | 10        | 21.5  | 38.5 | 42.0 | 37.5    | 10.2        | 35           | 350                   | 11.8                     | 12.4   | 7.2                 | 6.4    | 90                                       | 80               | MKP1848H61090+P*  |
|  | 12        | 30.0  | 45.0 | 42.0 | 37.5    | 10.2 / 20.3 | 35           | 420                   | 14.6                     | 15.4   | 6.3                 | 5.7    | 90                                       | 80               | MKP1848H61290+P*  |
|  | 15        | 30.0  | 45.0 | 42.0 | 37.5    | 10.2 / 20.3 | 35           | 525                   | 15.7                     | 16.5   | 5.5                 | 4.9    | 90                                       | 80               | MKP1848H61590+P*  |
|  | 20        | 30.0  | 45.0 | 42.0 | 37.5    | 10.2 / 20.3 | 35           | 700                   | 17.0                     | 18.0   | 4.7                 | 4.2    | 90                                       | 80               | MKP1848H62090+P*  |
|  | 22        | 30.0  | 45.0 | 57.5 | 52.5    | 20.3        | 18           | 396                   | 16.3                     | 17.2   | 6.4                 | 5.7    | 150                                      | 135              | MKP1848H62290+Y*  |
|  | 25        | 30.0  | 45.0 | 57.5 | 52.5    | 20.3        | 18           | 450                   | 17.2                     | 18.2   | 5.7                 | 5.1    | 150                                      | 135              | MKP1848H62590+Y*  |
|  | 30        | 30.0  | 45.0 | 57.5 | 52.5    | 20.3        | 18           | 540                   | 18.5                     | 19.5   | 4.9                 | 4.4    | 150                                      | 135              | MKP1848H63090+Y*  |
|  | 35        | 35.0  | 50.0 | 57.5 | 52.5    | 20.3        | 18           | 630                   | 21.2                     | 22.4   | 4.4                 | 3.9    | 150                                      | 135              | MKP1848H63590+Y*  |
| 40   | 35.0      | 50.0  | 57.5 | 52.5 | 20.3    | 18          | 720          | 22.3                  | 23.5                     | 4.0    | 3.6                 | 150    | 135                                      | MKP1848H64090+Y* |                   |
| U <sub>OPDC</sub> AT 70 °C = 1440 V; U <sub>OPDC</sub> AT 105 °C = 850 V |           |   |      |      |         |             |              |                       |                          |        |                     |        |  |                  |                   |
| 1200   | 1         | 15.0  | 25.0 | 32.0 | 27.5    | -           | 85           | 85                    | 4.5                      | -      | 24.8                | -      | 35                                       | -                | MKP1848H51012+K2  |
|  | 2         | 18.0  | 28.0 | 32.0 | 27.5    | -           | 85           | 170                   | 6.5                      | -      | 13.7                | -      | 35                                       | -                | MKP1848H52012+K2  |
|  | 3         | 21.0  | 31.0 | 32.0 | 27.5    | -           | 85           | 255                   | 8.3                      | -      | 10.0                | -      | 35                                       | -                | MKP1848H53012+K2  |
|  | 4         | 22.0  | 38.0 | 32.0 | 27.5    | -           | 85           | 340                   | 10.0                     | -      | 8.2                 | -      | 35                                       | -                | MKP1848H54012+K2  |
|  | 5         | 21.5  | 38.5 | 42.0 | 37.5    | 10.2        | 40           | 200                   | 9.8                      | 10.4   | 10.3                | 9.2    | 55                                       | 50               | MKP1848H55012+P*  |
|  | 6         | 21.5  | 38.5 | 42.0 | 37.5    | 10.2        | 40           | 240                   | 10.7                     | 11.2   | 8.7                 | 7.8    | 55                                       | 50               | MKP1848H56012+P*  |
|  | 7         | 30.0  | 45.0 | 42.0 | 37.5    | 10.2 / 20.3 | 40           | 280                   | 13.3                     | 14.0   | 7.6                 | 6.9    | 55                                       | 50               | MKP1848H57012+P*  |
|  | 8         | 30.0  | 45.0 | 42.0 | 37.5    | 10.2 / 20.3 | 40           | 320                   | 14.1                     | 14.9   | 6.8                 | 6.1    | 55                                       | 50               | MKP1848H58012+P*  |
|  | 10        | 30.0  | 45.0 | 42.0 | 37.5    | 10.2 / 20.3 | 40           | 400                   | 15.5                     | 16.3   | 5.6                 | 5.1    | 55                                       | 50               | MKP1848H61012+P*  |
|  | 12        | 30.0  | 45.0 | 57.5 | 52.5    | 20.3        | 20           | 240                   | 13.8                     | 14.6   | 8.9                 | 8.0    | 120                                      | 105              | MKP1848H61212+Y*  |
|  | 15        | 30.0  | 45.0 | 57.5 | 52.5    | 20.3        | 20           | 300                   | 15.2                     | 16.0   | 7.3                 | 6.6    | 120                                      | 105              | MKP1848H61512+Y*  |
|  | 20        | 35.0  | 50.0 | 57.5 | 52.5    | 20.3        | 20           | 400                   | 18.5                     | 19.5   | 5.8                 | 5.2    | 120                                      | 105              | MKP1848H62012+Y*  |
|  | 22        | 35.0  | 50.0 | 57.5 | 52.5    | 20.3        | 20           | 440                   | 19.2                     | 20.2   | 5.4                 | 4.8    | 120                                      | 105              | MKP1848H62212+Y*  |

Notes

- (1) Change the “\*” symbol with special code for the terminals and “+” for tolerance
- (2) Maximum RMS current at 10 kHz, +85 °C, Δt = +15 °C, capacitance tolerance ± 5 %, a typical ESR value at 10 kHz
- (3) Equivalent series resistance typical values at 10 kHz
- (4) Maximum tan δ values at 10 kHz
- (5) Standard dimensions, for maximum dimension please consult “Dimensions Tolerances”



| PACKAGING INFORMATION               |  |                   |      |      |                  |                   |             |                  |
|-------------------------------------|--|-------------------|------|------|------------------|-------------------|-------------|------------------|
| U <sub>NDC</sub><br>AT 85 °C<br>(V) | CAP. (1)<br>(µF)   | DIMENSION<br>(mm) |      |      | Ø dt<br>(mm)     | ORDERING CODE (2) | MASS<br>(g) | SPQ (3)<br>(pcs) |
|                                     |  | w                 | h    | l    |                  |                   |             |                  |
| 500                                 | <b>U<sub>OPDC</sub> AT 70 °C = 600 V; U<sub>OPDC</sub> AT 105 °C = 350 V</b> |                   |      |      |                  |                   |             |                  |
|                                     | 5  | 15.0              | 25.0 | 32.0 | 0.8              | MKP1848H55050+K2  | 14.5        | 100              |
|                                     | 6  | 15.0              | 25.0 | 32.0 | 0.8              | MKP1848H56050+K2  | 14.5        | 100              |
|                                     | 7  | 18.0              | 28.0 | 32.0 | 0.8              | MKP1848H57050+K2  | 20.5        | 80               |
|                                     | 8  | 18.0              | 28.0 | 32.0 | 0.8              | MKP1848H58050+K2  | 20.5        | 80               |
|                                     | 10   | 21.0              | 31.0 | 32.0 | 0.8              | MKP1848H61050+K2  | 27.5        | 56               |
|                                     | 12   | 21.0              | 31.0 | 32.0 | 0.8              | MKP1848H61250+K2  | 27          | 56               |
|                                     | 15   | 22.0              | 38.0 | 32.0 | 0.8              | MKP1848H61550+K2  | 34          | 56               |
|                                     | 20   | 21.5              | 38.5 | 42.0 | 1.0              | MKP1848H62050+P*  | 42.5        | 91               |
|                                     | 22   | 21.5              | 38.5 | 42.0 | 1.0              | MKP1848H62250+P*  | 42          | 91               |
|                                     | 25   | 21.5              | 38.5 | 42.0 | 1.0              | MKP1848H62550+P*  | 41          | 91               |
|                                     | 30   | 30.0              | 45.0 | 42.0 | 1.0              | MKP1848H63050+P*  | 70.5        | 63               |
|                                     | 35   | 30.0              | 45.0 | 42.0 | 1.0              | MKP1848H63550+P*  | 73          | 63               |
|                                     | 40   | 30.0              | 45.0 | 42.0 | 1.0              | MKP1848H64050+P*  | 70.5        | 63               |
|                                     | 45   | 30.0              | 45.0 | 42.0 | 1.0              | MKP1848H64550+P*  | 69.5        | 63               |
|                                     | 50   | 30.0              | 45.0 | 57.5 | 1.2              | MKP1848H65050+Y*  | 95.5        | 45               |
|                                     | 55   | 30.0              | 45.0 | 57.5 | 1.2              | MKP1848H65550+Y*  | 94          | 45               |
|                                     | 60   | 30.0              | 45.0 | 57.5 | 1.2              | MKP1848H66050+Y*  | 91.5        | 45               |
|                                     | 65   | 30.0              | 45.0 | 57.5 | 1.2              | MKP1848H66550+Y*  | 89.5        | 45               |
|                                     | 70   | 35.0              | 50.0 | 57.5 | 1.2              | MKP1848H67050+Y*  | 127         | 40               |
| 75                                  | 35.0   | 50.0              | 57.5 | 1.2  | MKP1848H67550+Y* | 124.5             | 40          |                  |
| 80                                  | 35.0   | 50.0              | 57.5 | 1.2  | MKP1848H68050+Y* | 120.5             | 40          |                  |
| 700                                 | <b>U<sub>OPDC</sub> AT 70 °C = 800 V; U<sub>OPDC</sub> AT 105 °C = 450 V</b> |                   |      |      |                  |                   |             |                  |
|                                     | 4  | 15.0              | 25.0 | 32.0 | 0.8              | MKP1848H54070+K2  | 14.5        | 100              |
|                                     | 5  | 18.0              | 28.0 | 32.0 | 0.8              | MKP1848H55070+K2  | 20.5        | 80               |
|                                     | 6  | 18.0              | 28.0 | 32.0 | 0.8              | MKP1848H56070+K2  | 20          | 80               |
|                                     | 7  | 21.0              | 31.0 | 32.0 | 0.8              | MKP1848H57070+K2  | 27          | 56               |
|                                     | 8  | 21.0              | 31.0 | 32.0 | 0.8              | MKP1848H58070+K2  | 26.5        | 56               |
|                                     | 10   | 22.0              | 38.0 | 32.0 | 0.8              | MKP1848H61070+K2  | 33.5        | 56               |
|                                     | 12   | 22.0              | 38.0 | 32.0 | 0.8              | MKP1848H61270+K2  | 33.5        | 56               |
|                                     | 15   | 21.5              | 38.5 | 42.0 | 1.0              | MKP1848H61570+P*  | 42          | 91               |
|                                     | 20   | 21.5              | 38.5 | 42.0 | 1.0              | MKP1848H62070+P*  | 39          | 91               |
|                                     | 22   | 30.0              | 45.0 | 42.0 | 1.0              | MKP1848H62270+P*  | 71          | 63               |
|                                     | 25   | 30.0              | 45.0 | 42.0 | 1.0              | MKP1848H62570+P*  | 69          | 63               |
|                                     | 30   | 30.0              | 45.0 | 42.0 | 1.0              | MKP1848H63070+P*  | 70          | 63               |
|                                     | 35   | 30.0              | 45.0 | 57.5 | 1.2              | MKP1848H63570+Y*  | 91.5        | 45               |
|                                     | 40   | 30.0              | 45.0 | 57.5 | 1.2              | MKP1848H64070+Y*  | 93.5        | 45               |
|                                     | 45   | 30.0              | 45.0 | 57.5 | 1.2              | MKP1848H64570+Y*  | 90          | 45               |
|                                     | 50   | 35.0              | 50.0 | 57.5 | 1.2              | MKP1848H65070+Y*  | 119         | 40               |
|                                     | 55   | 35.0              | 50.0 | 57.5 | 1.2              | MKP1848H65570+Y*  | 123         | 40               |
| 60                                  | 35.0   | 50.0              | 57.5 | 1.2  | MKP1848H66070+Y* | 120               | 40          |                  |



| PACKAGING INFORMATION               |  |                   |      |      |                  |                   |             |                  |
|-------------------------------------|--|-------------------|------|------|------------------|-------------------|-------------|------------------|
| U <sub>NDC</sub><br>AT 85 °C<br>(V) | CAP. (1)<br>(µF)   | DIMENSION<br>(mm) |      |      | Ø dt<br>(mm)     | ORDERING CODE (2) | MASS<br>(g) | SPQ (3)<br>(pcs) |
|                                     |  | w                 | h    | l    |                  |                   |             |                  |
| 800                                 | U <sub>OPDC</sub> AT 70 °C = 960 V; U <sub>OPDC</sub> AT 105 °C = 560 V  |                   |      |      |                  |                   |             |                  |
|                                     | 3  | 15.0              | 25.0 | 32.0 | 0.8              | MKP1848H53080+K2  | 14.5        | 100              |
|                                     | 4  | 18.0              | 28.0 | 32.0 | 0.8              | MKP1848H54080+K2  | 20.5        | 80               |
|                                     | 5  | 21.0              | 31.0 | 32.0 | 0.8              | MKP1848H55080+K2  | 26.5        | 56               |
|                                     | 6  | 21.0              | 31.0 | 32.0 | 0.8              | MKP1848H56080+K2  | 27          | 56               |
|                                     | 7  | 21.0              | 31.0 | 32.0 | 0.8              | MKP1848H57080+K2  | 26.5        | 56               |
|                                     | 8  | 22.0              | 38.0 | 32.0 | 0.8              | MKP1848H58080+K2  | 33          | 56               |
|                                     | 10   | 22.0              | 38.0 | 32.0 | 0.8              | MKP1848H61080+K2  | 33          | 56               |
|                                     | 12   | 21.5              | 38.5 | 42.0 | 1.0              | MKP1848H61280+P*  | 42          | 91               |
|                                     | 15   | 21.5              | 38.5 | 42.0 | 1.0              | MKP1848H61580+P*  | 40.5        | 91               |
|                                     | 20   | 30.0              | 45.0 | 42.0 | 1.0              | MKP1848H62080+P*  | 69          | 63               |
|                                     | 22   | 30.0              | 45.0 | 42.0 | 1.0              | MKP1848H62280+P*  | 71          | 63               |
|                                     | 25   | 30.0              | 45.0 | 42.0 | 1.0              | MKP1848H62580+P*  | 69.5        | 63               |
|                                     | 30   | 30.0              | 45.0 | 57.5 | 1.2              | MKP1848H63080+Y*  | 89          | 45               |
|                                     | 35   | 30.0              | 45.0 | 57.5 | 1.2              | MKP1848H63580+Y*  | 91.5        | 45               |
| 40                                  | 35.0   | 50.0              | 57.5 | 1.2  | MKP1848H64080+Y* | 119               | 40          |                  |
| 45                                  | 35.0   | 50.0              | 57.5 | 1.2  | MKP1848H64580+Y* | 124               | 40          |                  |
| 50                                  | 35.0   | 50.0              | 57.5 | 1.2  | MKP1848H65080+Y* | 119.5             | 40          |                  |
| 920                                 | U <sub>OPDC</sub> AT 70 °C = 1100 V; U <sub>OPDC</sub> AT 105 °C = 650 V |                   |      |      |                  |                   |             |                  |
|                                     | 2  | 15.0              | 25.0 | 32.0 | 0.8              | MKP1848H52090+K2  | 15          | 100              |
|                                     | 3  | 18.0              | 28.0 | 32.0 | 0.8              | MKP1848H53090+K2  | 20.5        | 80               |
|                                     | 4  | 18.0              | 28.0 | 32.0 | 0.8              | MKP1848H54090+K2  | 20          | 80               |
|                                     | 5  | 21.0              | 31.0 | 32.0 | 0.8              | MKP1848H55090+K2  | 27          | 56               |
|                                     | 6  | 22.0              | 38.0 | 32.0 | 0.8              | MKP1848H56090+K2  | 34.5        | 56               |
|                                     | 7  | 22.0              | 38.0 | 32.0 | 0.8              | MKP1848H57090+K2  | 34          | 56               |
|                                     | 8  | 22.0              | 38.0 | 32.0 | 0.8              | MKP1848H58090+K2  | 33.5        | 56               |
|                                     | 10   | 21.5              | 38.5 | 42.0 | 1.0              | MKP1848H61090+P*  | 42          | 91               |
|                                     | 12   | 30.0              | 45.0 | 42.0 | 1.0              | MKP1848H61290+P*  | 77          | 63               |
|                                     | 15   | 30.0              | 45.0 | 42.0 | 1.0              | MKP1848H61590+P*  | 74          | 63               |
|                                     | 20   | 30.0              | 45.0 | 42.0 | 1.0              | MKP1848H62090+P*  | 69.5        | 63               |
|                                     | 22   | 30.0              | 45.0 | 57.5 | 1.2              | MKP1848H62290+Y*  | 98          | 45               |
|                                     | 25   | 30.0              | 45.0 | 57.5 | 1.2              | MKP1848H62590+Y*  | 94          | 45               |
|                                     | 30   | 30.0              | 45.0 | 57.5 | 1.2              | MKP1848H63090+Y*  | 89.5        | 45               |
| 35                                  | 35.0   | 50.0              | 57.5 | 1.2  | MKP1848H63590+Y* | 124               | 40          |                  |
| 40                                  | 35.0   | 50.0              | 57.5 | 1.2  | MKP1848H64090+Y* | 119.5             | 40          |                  |
| 1200                                | U <sub>OPDC</sub> AT 70 °C = 1440 V; U <sub>OPDC</sub> AT 105 °C = 850 V |                   |      |      |                  |                   |             |                  |
|                                     | 1  | 15.0              | 25.0 | 32.0 | 0.8              | MKP1848H51012+K2  | 15          | 100              |
|                                     | 2  | 18.0              | 28.0 | 32.0 | 0.8              | MKP1848H52012+K2  | 20          | 80               |
|                                     | 3  | 21.0              | 31.0 | 32.0 | 0.8              | MKP1848H53012+K2  | 26.5        | 56               |
|                                     | 4  | 22.0              | 38.0 | 32.0 | 0.8              | MKP1848H54012+K2  | 33.5        | 56               |
|                                     | 5  | 21.5              | 38.5 | 42.0 | 1.0              | MKP1848H55012+P*  | 42.5        | 91               |
|                                     | 6  | 21.5              | 38.5 | 42.0 | 1.0              | MKP1848H56012+P*  | 41          | 91               |
|                                     | 7  | 30.0              | 45.0 | 42.0 | 1.0              | MKP1848H57012+P*  | 76          | 63               |
|                                     | 8  | 30.0              | 45.0 | 42.0 | 1.0              | MKP1848H58012+P*  | 74.5        | 63               |
|                                     | 10   | 30.0              | 45.0 | 42.0 | 1.0              | MKP1848H61012+P*  | 70.5        | 63               |
|                                     | 12   | 30.0              | 45.0 | 57.5 | 1.2              | MKP1848H61212+Y*  | 97.5        | 45               |
|                                     | 15   | 30.0              | 45.0 | 57.5 | 1.2              | MKP1848H61512+Y*  | 92.5        | 45               |
|                                     | 20   | 35.0              | 50.0 | 57.5 | 1.2              | MKP1848H62012+Y*  | 122.5       | 40               |
|                                     | 22   | 35.0              | 50.0 | 57.5 | 1.2              | MKP1848H62212+Y*  | 119.5       | 40               |

Notes

- (1) Intermediate capacitance values available on request
- (2) Change the “\*” symbol with special code for the terminals, and “+” for tolerance
- (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.

**DIMENSIONS TOLERANCES**

For the maximum product dimensions for length ( $l_{max.}$ ), width ( $w_{max.}$ ), and height ( $h_{max.}$ ) use the following tolerances:

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

$$\text{Pitch} = 27.5 \text{ mm}, \Delta w = \Delta l = \Delta h = 0.7 \text{ mm}$$

$$\text{Pitch} = 37.5 \text{ mm}, \Delta w = \Delta l = \Delta h = 0.7 \text{ mm}$$

$$\text{Pitch} = 52.5 \text{ mm}, \Delta w = \Delta l = \Delta h = 1.0 \text{ mm}$$

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

$$\text{Pitch} = 27.5 \text{ mm}, \Delta w = \Delta l = \Delta h = 1.0 \text{ mm}$$

$$\text{Pitch} = 37.5 \text{ mm}, \Delta w = \Delta l = \Delta h = 1.0 \text{ mm}$$

$$\text{Pitch} = 52.5 \text{ mm}, \Delta w = \Delta l = \Delta h = 1.5 \text{ mm}$$

**SPACE REQUIREMENTS ON PRINTED-CIRCUIT BOARD**

For product height with seating plane as given by "IEC 60717" as reference.

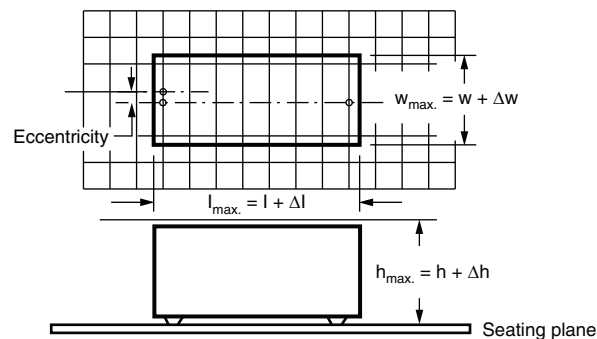
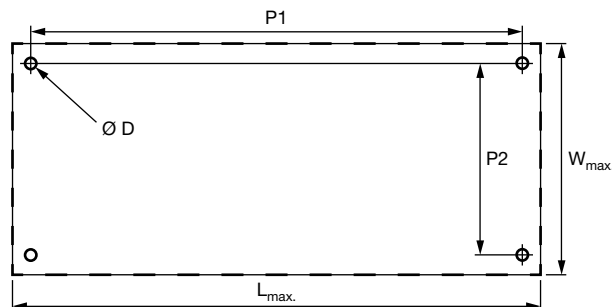
**For 2 pins:**

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

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

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


**For 4 pins:**




| P1 (mm) | L <sub>max.</sub> (mm) | W <sub>max.</sub> (mm) | Ø D (mm) | Δh (mm) |
|---------|------------------------|------------------------|----------|---------|
| 37.5    | l + 1.5                | w + 1.8                | 1.5      | h + 0.7 |
| 52.5    | l + 1.8                | w + 2.0                | 1.7      | h + 0.7 |

**SOLDERING CONDITIONS**

For general soldering conditions and wave soldering profile we refer to the document “Soldering Conditions Vishay Film Capacitors”: [www.vishay.com/doc?26033](http://www.vishay.com/doc?26033)

**STORAGE TEMPERATURE**

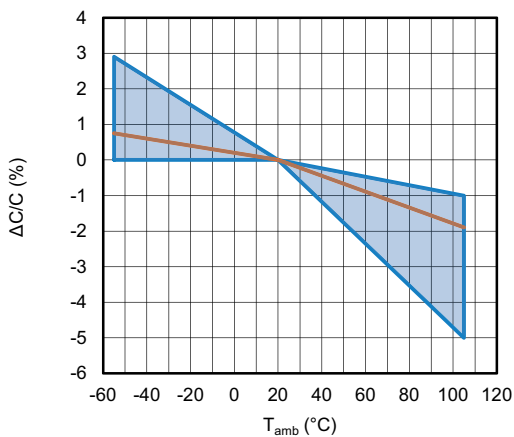
T<sub>stg</sub> = -25 °C to +35 °C with RH maximum 75 % without condensation.

**RATINGS AND CHARACTERISTICS REFERENCE CONDITIONS**

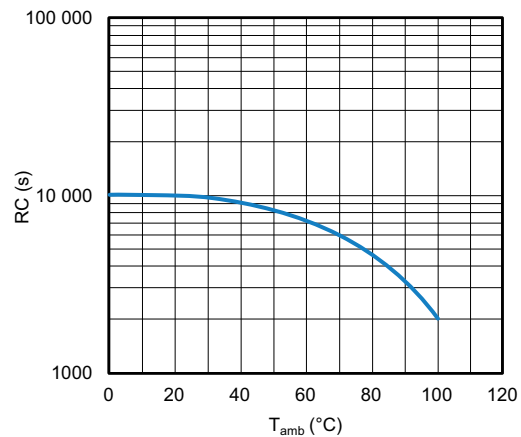
Unless otherwise specified, all electrical values apply to an ambient temperature of 23 °C ± 1 °C, an atmospheric pressure of 86 kPa to 106 kPa, and a relative humidity of 50 % ± 2 %.

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 %.

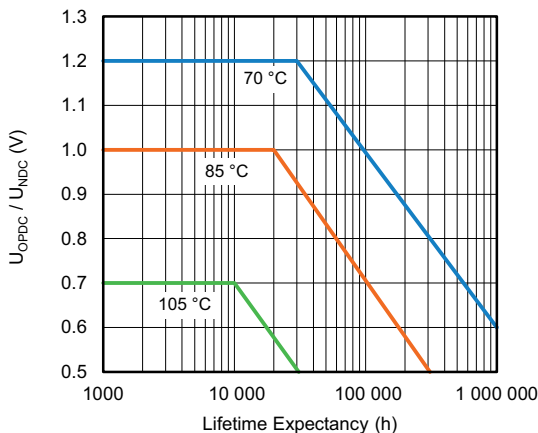
**CHARACTERISTICS**



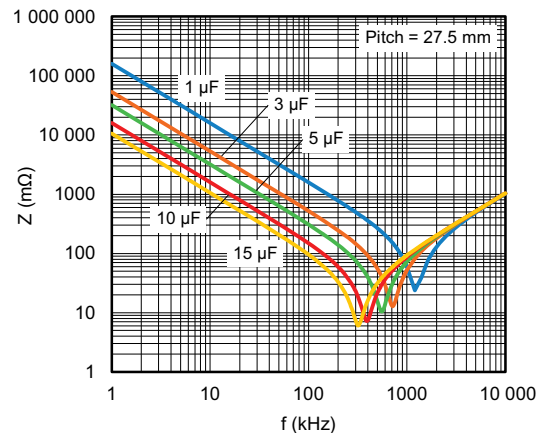
Capacitance as a function of ambient temperature (typical)



Insulation resistance as a function of ambient temperature (typical)

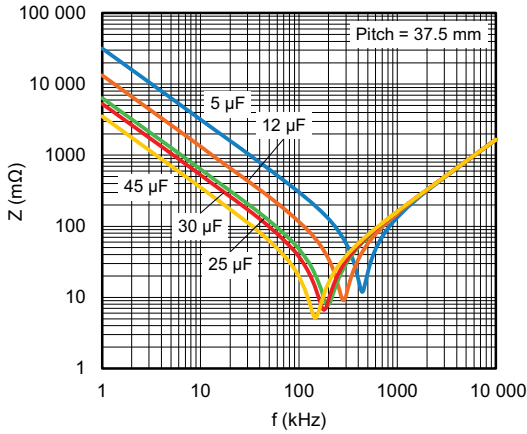


Lifetime expectancy by case temperature (typical)

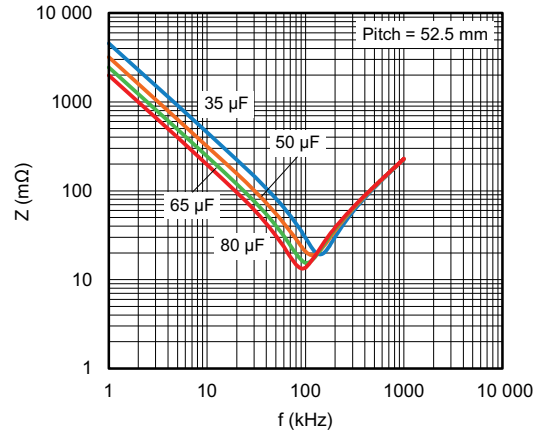


Impedance as a function of frequency (typical)

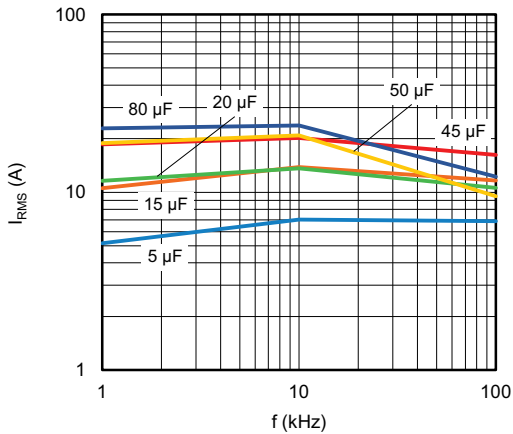




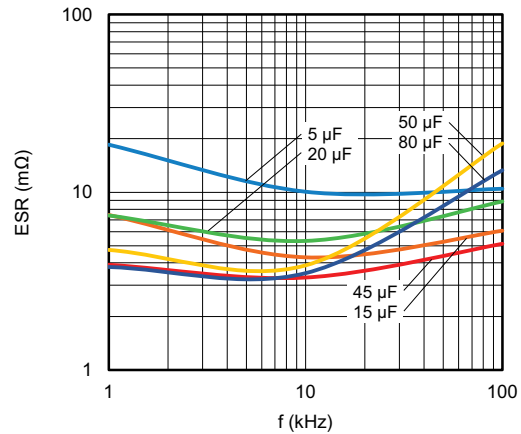
Impedance as a function of frequency (typical)



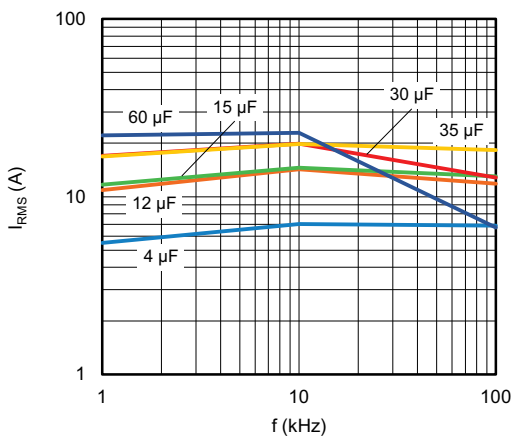
Impedance as a function of frequency (typical)



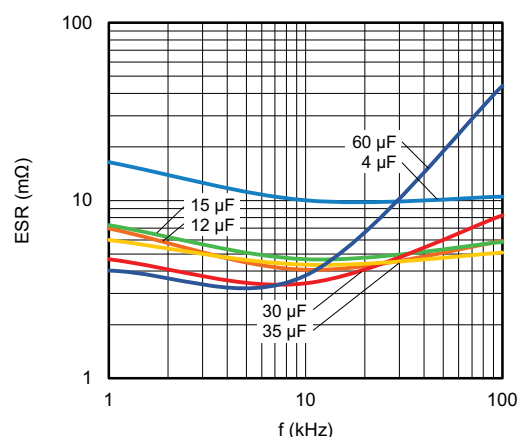
Maximum  $I_{RMS}$  current as function of frequency (500  $V_{DC}$ ), based  $T_A + 85^\circ C$ ,  $\Delta t = +15^\circ C$ , capacitance tolerance  $\pm 5\%$  (typical curve)



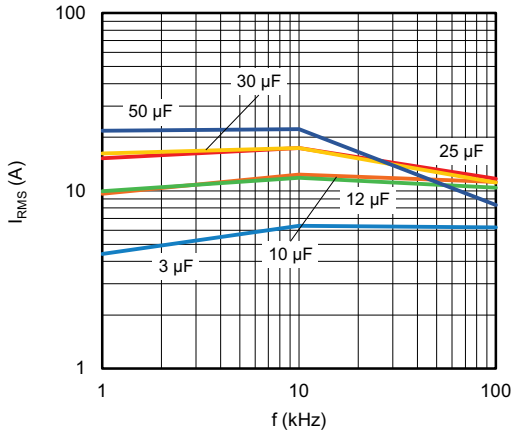
ESR as function of frequency (500  $V_{DC}$ ) (typical curve)



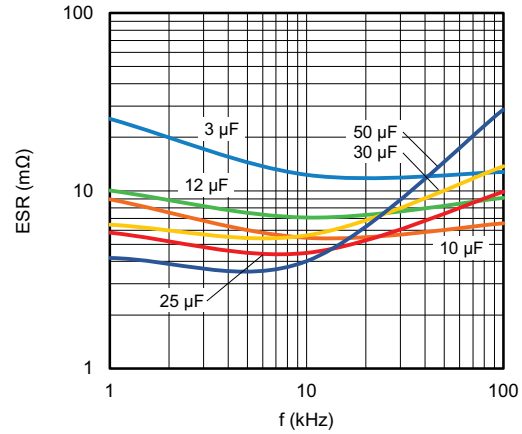
Maximum  $I_{RMS}$  current as function of frequency (700  $V_{DC}$ ), based  $T_A + 85^\circ C$ ,  $\Delta t = +15^\circ C$ , capacitance tolerance  $\pm 5\%$  (typical curve)



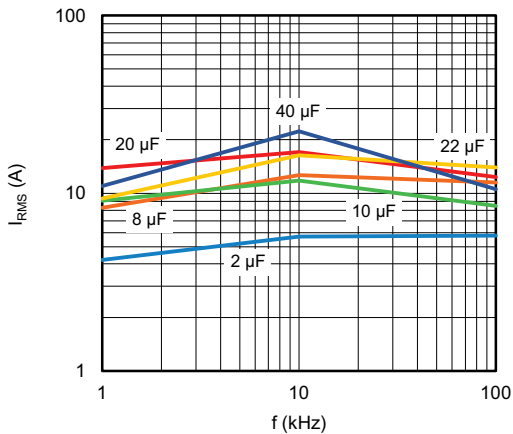
ESR as function of frequency (700  $V_{DC}$ ) (typical curve)



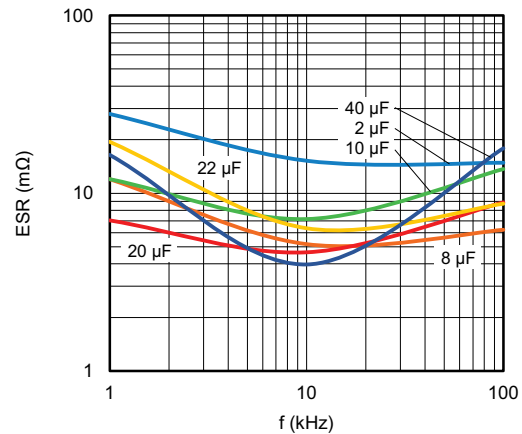
Maximum  $I_{RMS}$  current as function of frequency (800  $V_{DC}$ ), based  $T_A + 85^\circ C$ ,  $\Delta t = +15^\circ C$ , capacitance tolerance  $\pm 5\%$ , (typical curve)



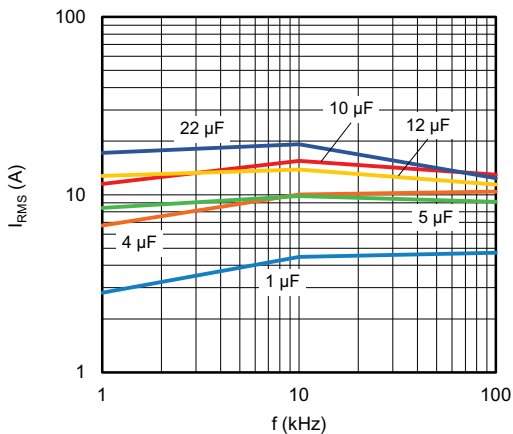
ESR as function of frequency (800  $V_{DC}$ ) (typical curve)



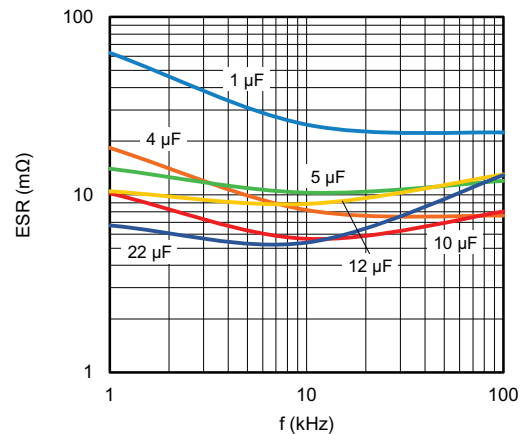
Maximum  $I_{RMS}$  current as function of frequency (920  $V_{DC}$ ), based  $T_A + 85^\circ C$ ,  $\Delta t = +15^\circ C$ , capacitance tolerance  $\pm 5\%$ , (typical curve)



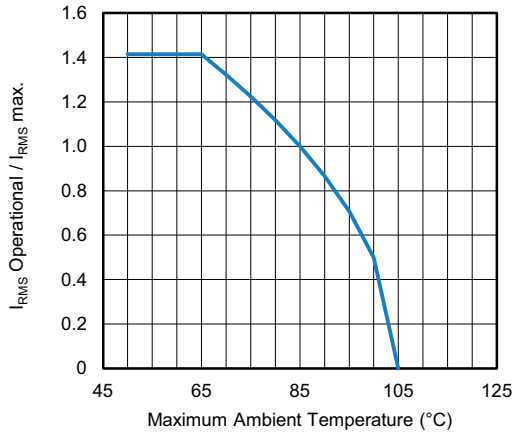
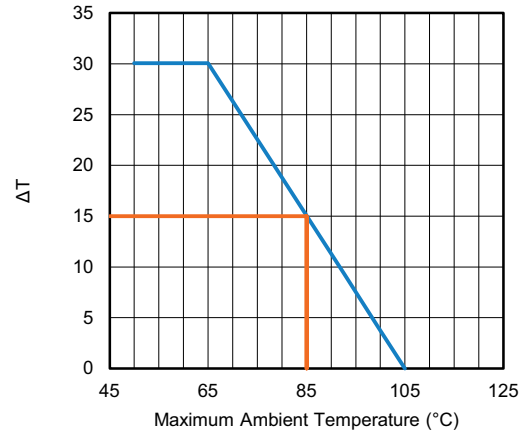
ESR as function of frequency (920  $V_{DC}$ ) (typical curve)



Maximum  $I_{RMS}$  current as function of frequency (1200  $V_{DC}$ ), based  $T_A + 85^\circ C$ ,  $\Delta t = +15^\circ C$ , capacitance tolerance  $\pm 5\%$ , (typical curve)



ESR as function of frequency (1200  $V_{DC}$ ) (typical curve)


 Maximum  $I_{RMS}$  current in function of the ambient temperature

 Maximum allowed component temperature rise ( $\Delta T$ ) as a function of ambient temperature ( $T_{amb}$ )

| HEAT CONDUCTIVITY |      |      |                           |
|-------------------|------|------|---------------------------|
| DIMENSIONS (mm)   |      |      | HEAT CONDUCTIVITY (mW/°C) |
| w                 | h    | l    |                           |
| 15.0              | 25.0 | 32.0 | 33                        |
| 18.0              | 28.0 | 32.0 | 39                        |
| 21.0              | 31.0 | 32.0 | 46                        |
| 22.0              | 38.0 | 32.0 | 55                        |
| 21.5              | 38.5 | 42.0 | 66                        |
| 30.0              | 45.0 | 42.0 | 90                        |
| 30.0              | 45.0 | 57.5 | 113                       |
| 35.0              | 50.0 | 57.5 | 132                       |

### POWER DISSIPATION AND MAXIMUM COMPONENT TEMPERATURE RISE

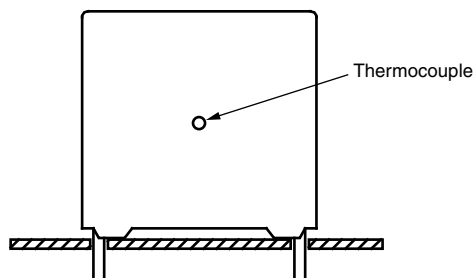
The power dissipation must be limited in order not to exceed the maximum allowed component temperature rise as a function of the free air ambient temperature.

The power dissipation can be calculated according type detail specification [www.vishay.com/doc?28147](http://www.vishay.com/doc?28147)

The component temperature rise ( $\Delta T$ ) can be measured (see section “Measuring the Component Temperature” for more details) or calculated by  $\Delta T = P/G$ :

- $\Delta T = T_C - T_{amb}$  = case temperature rise (°C) with a maximum of 15 °C at rated temperature
- $P = I_{RMS}^2 \times ESR$  = 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 condition ( $T_{amb}$ ) and loaded condition ( $T_C$ ).

The temperature rise is given by  $\Delta T = T_C - T_{amb}$

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**

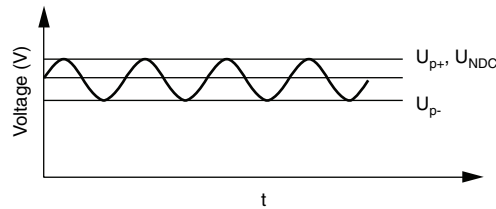
These capacitors are not suitable for mains applications as across-the-line capacitors without additional protection.

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](mailto: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:

$$2 \times \int_0^T \left( \frac{du}{dt} \right)^2 \times dt < U_{NDC} \times \left( \frac{du}{dt} \right)_{\text{rated}}$$

T is the pulse duration

| <b>MAXIMUM REPETITIVE PEAK VOLTAGES</b> |                                 |
|---|---------------------------------|
| <b>REPETITIVE SURGE VOLTAGE</b>         | <b>MAXIMUM DURATION PER DAY</b> |
| $1.1 \times U_{NDC}$                    | 30 % 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 surge above without any significant reduction of lifetime expectancy



| TEST CONDITIONS AND REQUIREMENTS ACCORDING IEC 61071 |  |  |                              |   |   |
|--|--|--|------------------------------|---|---|
| SUB-CLAUSE NUMBER AND TEST                           |  | CONDITIONS   |                              | PERFORMANCE REQUIREMENTS  |   |
| <b>ROUTINE TEST - FINAL INSPECTION</b>               |  |  |                              |   |   |
| 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 $\delta$                                   | 10 kHz at room temperature   |                              | See specific reference data   |   |
| 5.5.1-2  | DC voltage test between terminals              | 1.5 x U <sub>NDC</sub> at T <sub>amb</sub><br>Duration: 10 s   |                              | No visible damage or puncture<br>No flashover   |   |
| 5.7  | Insulation resistance                          | Measuring voltage 500 V at room temperature<br>Duration: 1 min   |                              | See specific reference data   |   |
| <b>TYPE TESTS</b>                                    |  |  |                              |   |   |
| 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<br>IEC 60068-2-21   | Tensile Ua1: duration: 10 s $\pm$ 1 s  |                              |   |   |
|  |  | Wire diameter  | Section                      |   | Load  |
|  |  | d $\leq$ 0.80 mm   | S $\leq$ 0.5 mm <sup>2</sup> |   | 10 N ( $\pm$ 10 %)  |
|  |  | d $\leq$ 1.25 mm   | S $\leq$ 1.2 mm <sup>2</sup> |   | 20 N ( $\pm$ 10 %)  |
|  |  | Bending, Ub method 1: 4 x 90 °,<br>duration 2 s to 3 s/bend  |                              |   |   |
|  |  | Wire diameter  | Section                      |   | Load  |
| d $\leq$ 0.80 mm                                     | Z <sub>x</sub> $\leq$ 0.050 mm <sup>3</sup>    | 5 N ( $\pm$ 10 %)  |                              |   |   |
| d $\leq$ 1.25 mm                                     | Z <sub>x</sub> $\leq$ 0.019 mm <sup>3</sup>    | 10 N ( $\pm$ 10 %)   |                              |   |   |
| 5.14.1-6   | Resistance to soldering heat<br>IEC 60068-2-20 | No predrying, method 1A<br>Solder bath: 280 °C $\pm$ 5 °C<br>Duration: 10 s $\pm$ 1 s                              |                              |   |   |
| 5.14.4   | Final measurements                             | Capacitance<br>tan $\delta$  |                              | \Delta C/C  $\leq$ 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   |                              | No visible damage   |   |
| 5.14.3-1   | Vibration<br>IEC 60068-2-6                     | 10 Hz to 55 Hz: amplitude $\pm$ 0.35 mm or<br>acceleration 98 m/s <sup>2</sup>                                     |                              |   |   |
|  |  | Test duration: 10 frequency cycles<br>(3 axes offset from each other by 90°)<br>1 octave/min<br>Visual examination |                              |   |   |
| 5.14.3-2   | Shock or impact<br>IEC 60068-2-6               | Pulse shape: half sine<br>Acceleration: 490 m/s <sup>2</sup><br>Duration of pulse: 11 ms                           |                              |   |   |
| 5.14.4   | Final measurements                             | Visual examination<br>Capacitance<br>tan $\delta$  |                              |   | No visible damage<br> \Delta C/C  $\leq$ 0.5 %<br>Increase of tan $\delta$ $\leq$ 0.0050<br>Compared to values measured in 5.14.0 |



| TEST CONDITIONS AND REQUIREMENTS ACCORDING IEC 61071 |   |  |
|--|---|--|
| SUB-CLAUSE NUMBER AND TEST                           | CONDITIONS  | PERFORMANCE REQUIREMENTS   |
| <b>TYPE TESTS</b>                                    |   |  |
| 5.5.3-1 Initial measurements                         | Capacitance at 1 kHz<br>tan $\delta$ at 10 kHz<br>Insulation resistance   |  |
| 5.5.3-2 DC voltage test between terminals            | 1.5 x U <sub>NDC</sub> at T <sub>amb</sub><br>Duration: 60 s  |  |
| 5.5.3-3 Final measurements                           | Capacitance<br>tan $\delta$<br>Insulation resistance  | $ \Delta C/C  \leq 0.5 \%$<br>Increase of tan $\delta \leq 0.0050$<br>IR $\geq 50 \%$ of specified values  |
| 5.9-1 Initial measurements                           | Capacitance at 1 kHz<br>tan $\delta$ at 10 kHz<br>Insulation resistance   |  |
| 5.9-2 Surge discharge test                           | 1.1 x U <sub>NDC</sub><br>Number of discharges: 5<br>Time lapse: every 2 min (10 min total)   |  |
| 5.9-2 DC voltage test between terminals              | Within 5 min after the surge discharge test<br>1.5 x U <sub>NDC</sub> at T <sub>amb</sub><br>Duration: 60 s   |  |
| 5.9-3 Final measurements                             | Capacitance<br>tan $\delta$<br><br>Insulation resistance  | $ \Delta C/C  \leq 1.0 \%$<br>tan $\delta \leq 1.2 \times$ initial tan $\delta + 0.0001$<br>Compared to values measured in 5.9-1<br>IR $\geq 50 \%$ of specified values  |
| 5.11-1 Initial measurements                          | Capacitance at 1 kHz<br>tan $\delta$ at 10 kHz<br>Insulation resistance   |  |
| 5.11-2 Self healing test                             | 1.5 x U <sub>NDC</sub><br>Duration: 10 s<br>increase the voltage at 100 V/s till 5 clearings occur or until voltage reach max. of 2.5 x U <sub>NDC</sub> for a duration of 10 s | Number of clearings $\leq 5$<br>Clearing = voltage drop of 5 %   |
| 5.11-3 Final measurements                            | Capacitance<br>tan $\delta$<br><br>Insulation resistance  | $ \Delta C/C  \leq 0.5 \%$<br>tan $\delta \leq 1.2 \times$ initial tan $\delta + 0.0001$<br>Compared to values measured in 5.11.1<br>IR $\geq 50 \%$ of specified values   |
| 5.13-0 Initial measurements                          | Capacitance at 1 kHz<br>tan $\delta$ at 10 kHz<br>Insulation resistance   |  |
| 5.13-1 Change of temperature acc. to IEC 60068-2-14  | Test Nb<br>T <sub>max.</sub> = 85 °C<br>T <sub>min.</sub> = -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 $\pm$ 2 °C<br>RH = 93 % $\pm$ 3 %<br>Duration: 56 days   |  |
| 5.5.3-2 DC voltage test between terminals            | 1.5 x U <sub>NDC</sub> at ambient temperature<br>Duration: 60 s   |  |
| 5.13.3 Final measurements                            | Visual examination<br><br>Capacitance<br>tan $\delta$<br><br>Insulation resistance  | No puncturing or flashover<br>Self healing punctures are permitted<br><br>$ \Delta C/C  \leq 2.0 \%$<br>Increase of tan $\delta \leq 0.0150$<br>Compared to values measured in 5.13-0<br>IR $\geq 50 \%$ of specified values |



| TEST CONDITIONS AND REQUIREMENTS ACCORDING IEC 61071      |   |  |
|---|---|--|
| SUB-CLAUSE NUMBER AND TEST                                | CONDITIONS  | PERFORMANCE REQUIREMENTS   |
| <b>TYPE TESTS</b>   |   |  |
| 5.13A-0 Initial measurements                              | Capacitance at 1 kHz<br>tan $\delta$ at 1 kHz<br>Insulation resistance  |  |
| 5.13A.2 Accelerate damp heat steady state with load       | T = 85 °C<br>RH = 85 % at U <sub>NDC</sub><br>Duration 1000 h   |  |
| 5.13.3 Final measurements                                 | Capacitance at 1 kHz<br>tan $\delta$ at 1 kHz<br><br>Insulation resistance  | $ \Delta C/C  < 10\%$<br>Increase of tan $\delta \leq 0.0100$<br>Compared to values measured in 5.13A.0<br>IR $\geq 50\%$ of specified values  |
| 5.10-0 Initial measurements                               | Capacitance at 1 kHz<br>tan $\delta$ at 10 kHz<br>Insulation resistance   |  |
| 5.10-1 Thermal stability test under overload conditions   | Natural cooling T <sub>amb</sub> $\pm 5$ °C<br>$1.21 \times P_{max.} = 1.21 \times (I_{RMS}^2/w \times C) \times \tan \delta(f)$<br>with $w = 2 \times \pi \times f$<br>for I <sub>RMS</sub> see specific reference data f = 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<br>Insulation resistance   | Temperature rise < 1 °C<br><br>$ \Delta C/C  \leq 2\%$<br>Increase of tan $\delta \leq 0.0150$<br>IR $\geq 50\%$ of specified values           |
| 5.12 Resonance frequency measurement                      | Impedance analyzer at T <sub>amb</sub>  | > 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<br>Insulation resistance   |  |
| 5.15-1 Endurance test between terminals                   | Sequence<br>1.3 x U <sub>NDC</sub> at 85 °C<br>1.3 x U <sub>OPDC</sub> at 105 °C<br>Duration: 500 h<br><br>1000 x discharge at 1.4 x $\hat{i}$<br>(maximum peak current)<br><br>1.3 x U <sub>NDC</sub> at 85 °C<br>1.3 x U <sub>OPDC</sub> at 105 °C<br>Duration: 500 h |  |
| 5.15-2 Final measurements                                 | Capacitance<br>tan $\delta$<br><br>Insulation resistance  | $ \Delta C/C  \leq 3\%$<br>Increase of tan $\delta \leq 0.0150$<br>Compared to values measured in 5.15-0<br>IR $\geq 50\%$ of specified values |
| 5.16.3-0 Initial measurements                             | Capacitance at 1 kHz  |  |
| 5.16.3-1 Destruction test sequence for non-segmented film | The capacitors must be put in an oven at T <sub>max.</sub> = 85 °C, product enveloped with cheese cloth   |  |
| High DC voltage test                                      | 3 x U <sub>NDC</sub> or DC voltage until repetitive product healings occur, duration: 15 min  | Audible healings or check healings with oscilloscope   |
| High AC voltage test                                      | AC <sub>RMS</sub> voltage = U <sub>NDC</sub> /2 $\sqrt{2}$ with min. 250 V <sub>AC</sub><br>Duration: 5 min<br><br>Repeat destruction sequence 3 x  |  |
| 5.16.3-2 Final measurements                               | Visual examination  | No puncturing, flashover or burning of the cheese cloth<br>Self healing punctures are permitted  |



| TEST CONDITIONS AND REQUIREMENTS ACCORDING AEC-Q200 REVISION D |                                      |                         |   |  |
|--|--------------------------------------|-------------------------|---|--|
| NO.  | TEST NAME                            | REFERENCE               | TEST CONDITIONS   | PERFORMANCE REQUIREMENTS   |
| 1  | Pre- and post-stress electrical test | Spec.                   | -   | -  |
| 3  | High temperature exposure (storage)  | MIL-STD 202 method 108  | 85 °C; unpowered<br>250 h / 500 h / 1000 h  | $ \Delta C/C  \leq 3\%$<br>Increase of $\tan \delta$ (10 kHz) $\leq 0.005$<br>IR > 50 % of initial specified value   |
| 4  | Temperature cycling                  | JESD22 method JA-104    | 1000 cycles: -40 °C / +85 °C<br>30 min. dwell time at each temperature extreme<br>Transition time < 1 min.              | $ \Delta C/C  \leq 2\%$<br>Increase of $\tan \delta$ (10 kHz) $\leq 0.005$<br>IR > 50 % of initial specified value   |
| 6  | Moisture resistance                  | MIL-STD 202 method 106  | 10 cycles at 24 h/cycle unpowered   | $ \Delta C/C  \leq 2\%$<br>Increase of $\tan \delta$ (10 kHz) $\leq 0.005$<br>IR > 50 % of initial specified value   |
| 7  | Biased humidity                      | MIL-STD 202 method 103  | 40 °C; 93 % RH; $U_{RDC}$<br>250 h / 500 h / 1000 h   | $ \Delta C/C  \leq 2\%$<br>Increase of $\tan \delta$ (10 kHz) $\leq 0.005$<br>IR > 50 % of initial specified value   |
| 8  | Operational life                     | MIL-STD 202 method 108  | $T_{amb} = 85\text{ °C}$ ; $1.25 \times U_{RDC}$<br>250 h / 500 h / 1000 h /<br>(+ additional 2000 h)                   | $ \Delta C/C  \leq 3\%$<br>Increase of $\tan \delta$ (10 kHz) $\leq 0.005$<br>IR > 50 % of initial specified value   |
| 9  | External visual                      | MIL-STD 883 method 2009 | Device construction, marking, and workmanship   | Device construction and workmanship;<br>legible marking  |
| 10   | Physical dimension                   | JESD22 method JB-100    | Spec.   | Datasheet  |
| 11   | Terminal strength (lead)             | MIL-STD 202 method 211  | Test leaded device lead integrity only.<br>- A (pull-test): 44.1 N (10 s)<br>- C (wire-lead bend test): 227 g (3 x 3 s) | No visual damage   |
| 12   | Resistance to solvents               | MIL-STD 202 method 215  | Also aqueous chemical - OKEM clean or equivalent. Do not use banned solvents.   | No visual damage<br>Legible marking  |
| 13   | Mechanical shock                     | MIL-STD 202 method 213  | 100 g's; 6 ms<br>half-sine; 3.75 m/s  | No visual damage   |
| 14   | Vibration                            | MIL-STD 202 method 204  | 5 g's for 20 min;<br>12 cycles x 3 directions<br>10 Hz to 2000 Hz   | No visual damage   |
| 15   | Resistance to soldering heat         | MIL-STD 202 method 210  | 280 °C; 10 s<br>solder within 1.5 mm of device body   | $ \Delta C/C  \leq 0.5\%$<br>Increase of $\tan \delta$ (10 kHz) $\leq 0.005$<br>IR > 50 % of initial specified value |
| 17   | ESD                                  | -                       | -   | -  |
| 18   | Solderability                        | J-STD-002               | Leaded: method A at 235 °C,<br>category 3 (245 °C / 3 s)  | Good tinning as evidence by free flowing of the solder with wetting of terminations > 95 %                           |
| 19   | Electrical characterization          | -                       | -   | -  |
| 20   | Flammability                         | UL-94 IEC 60384-1       | One flame application<br>Class B  | V-0 or V-1 are acceptable.<br>Class B or C acc. IEC is also acceptable   |

**Note**

Measurement conditions at 23 °C:

- Capacitance at 1 kHz
- $\tan \delta$  10 kHz (additional 1 kHz and ESR 10 kHz)
- Insulation resistance 500 V, 1 min after full charge
- Dimensions w x h x l





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