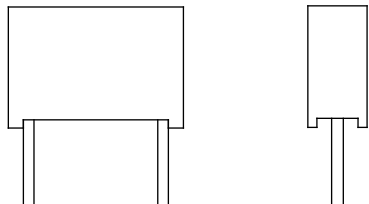




## AC and Pulse Metallized Polypropylene Film Capacitors MKP Radial Potted Type



### FEATURES

- 5 mm to 37.5 mm lead pitch
- Material categorization:  
for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

### APPLICATIONS

High frequency and pulse operations. SMPS, loudspeaker crossover networks, electronic ballast, storage, filter, timing and sample and hold circuits.



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

| QUICK REFERENCE DATA                           |   |
|--|---|
| Capacitance range                              | 1000 pF to 6.8 $\mu$ F  |
| Capacitance tolerance                          | $\pm 5\%$ , $\pm 2\%$ , $\pm 2.5\%$ ( $\pm 10\%$ on request)  |
| Climatic testing class according to EN 60068-1 | 55/100/56   |
| Maximum application temperature                | 100 °C  |
| Reference standards                            | IEC 60384-16  |
| Dielectric                                     | Polypropylene film  |
| Electrodes                                     | Metallized  |
| Construction                                   | Mono and internal series construction   |
| Encapsulation                                  | Plastic case, epoxy resin sealed, flame retardant<br>UL-class 94 V-0  |
| Leads  | Tinned wire   |
| Marking  | C-value; tolerance; rated voltage; manufacturer's type; code for dielectric material; manufacturer location; manufacturer's logo; year and week         |
| Rated DC voltages                              | 250 V <sub>DC</sub> , 400 V <sub>DC</sub> , 630 V <sub>DC</sub> , 1000 V <sub>DC</sub> , 1600 V <sub>DC</sub> , 2000 V <sub>DC</sub>                    |
| Rated AC voltages                              | 160 V <sub>AC</sub> , 220 V <sub>AC</sub> , 250 V <sub>AC</sub> , 400 V <sub>AC</sub> , 500 V <sub>AC</sub> , 600 V <sub>AC</sub> , 700 V <sub>AC</sub> |

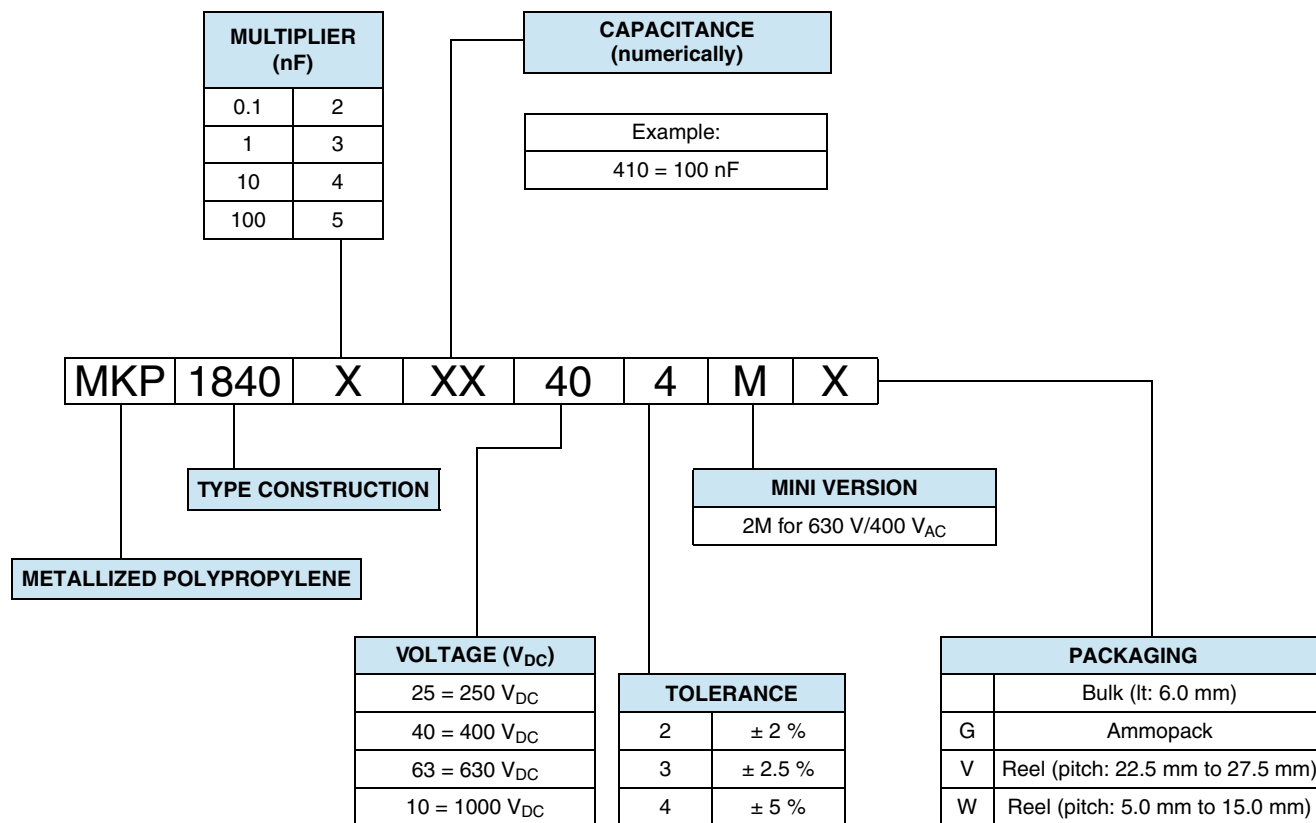
### Note

- For more detailed data and test requirements, contact [dc-film@vishay.com](mailto:dc-film@vishay.com)

| DIMENSIONS in millimeters |             |              |
|---------------------------|-------------|--------------|
|                           |             |              |
| LEAD DIAMETER<br>$d_t$    | W           | PITCH        |
| 0.5 $\pm$ 0.05            | -           | 5 to 7.5     |
| 0.6 $\pm$ 0.06            | -           | 10           |
| 0.6 $\pm$ 0.06            | $\leq 6$    | 15           |
| 0.8 $\pm$ 0.08            | $> 6$       | 15           |
| 0.8 $\pm$ 0.08            | $< 16$      | 22.5 to 37.5 |
| 1.0 $\pm$ 0.1             | $\geq 16.5$ | 22.5 to 37.5 |



**COMPOSITION OF CATALOG NUMBER**



**Note**

- For detailed tape specifications refer to packaging information [www.vishay.com/doc?28139](http://www.vishay.com/doc?28139) or end of catalog

| SPECIFIC REFERENCE DATA   |   |                     |                       |                                |                       |                      |
|---|---|---------------------|-----------------------|--------------------------------|-----------------------|----------------------|
| DESCRIPTION   | VALUE   |                     |                       |                                |                       |                      |
| Tangent of loss angle:  | at 1 kHz  |                     | at 10 kHz             |                                | at 100 kHz            |                      |
| C ≤ 0.1 μF  | 10 x 10 <sup>-4</sup>                               |                     | 10 x 10 <sup>-4</sup> |                                | 40 x 10 <sup>-4</sup> |                      |
| 0.1 μF < C ≤ 1.0 μF   | 10 x 10 <sup>-4</sup>                               |                     | 10 x 10 <sup>-4</sup> |                                | -                     |                      |
| C > 1.0 μF  | 10 x 10 <sup>-4</sup>                               |                     | -                     |                                | -                     |                      |
| PITCH (mm)  | MAXIMUM PULSE RISE TIME (dU/dt) <sub>R</sub> [V/μs] |                     |                       |                                |                       |                      |
|   | 250 V <sub>DC</sub>                                 | 400 V <sub>DC</sub> | 630 V <sub>DC</sub>   | 1000 V <sub>DC</sub>           | 1600 V <sub>DC</sub>  | 2000 V <sub>DC</sub> |
| 5   | 360   | 540                 | 1080                  | -                              | -                     | -                    |
| 7.5   | 215   | 325                 | 510                   | -                              | -                     | -                    |
| 10  | 150   | 240                 | 340                   | 1365                           | 4100                  | -                    |
| 15  | 90  | 135                 | 185                   | 680                            | 1340                  | 3075                 |
| 22.5  | 55  | 80                  | 110                   | 370                            | 620                   | 1365                 |
| 27.5  | 40  | 65                  | 85                    | 285                            | 455                   | -                    |
| 37.5  | 30  | 45                  | 60                    | 195                            | 300                   | -                    |
| R between leads, for C ≤ 1.0 μF at 100 V, 1 min   |   |                     |                       | > 100 000 MΩ                   |                       |                      |
| RC between leads, for C > 1.0 μF at 100 V, 1 min  |   |                     |                       | > 100 000 s                    |                       |                      |
| R between leads and case, 100 V, 1 min  |   |                     |                       | > 30 000 MΩ                    |                       |                      |
| Withstanding (DC) voltage (cut off current 10 mA) <sup>(1)</sup> ; rise time ≤ 1000 V/s |   |                     |                       | 1.6 x U <sub>RDC</sub> , 1 min |                       |                      |
| Withstanding (DC) voltage between leads and case  |   |                     |                       | 500 V, 1 min                   |                       |                      |
| Maximum application temperature   |   |                     |                       | 100 °C                         |                       |                      |

**Note**

- <sup>(1)</sup> See "Voltage Proof Test for Metalized Film Capacitors": [www.vishay.com/doc?28169](http://www.vishay.com/doc?28169)

**METALLIZED POLYPROPYLENE FILM CAPACITOR, MINI VERSION (M)**

| <b>ELECTRICAL DATA</b>               |                            |                                   |                               |                       |   |                           |
|--------------------------------------|----------------------------|-----------------------------------|-------------------------------|-----------------------|---|---------------------------|
| <b>U<sub>RDC</sub></b><br><b>(V)</b> | <b>CAP.</b><br><b>(μF)</b> | <b>CAPACITANCE</b><br><b>CODE</b> | <b>VOLTAGE</b><br><b>CODE</b> | <b>V<sub>AC</sub></b> | <b>DIMENSIONS <sup>(3)</sup></b><br><b>w x h x l</b><br><b>(mm)</b> | <b>PCM</b><br><b>(mm)</b> |
| 250                                  | 0.010                      | -310                              | 25                            | 160                   | 3.5 x 8.5 x 7.5   | 5.0                       |
|                                      | 0.015                      | -315                              |                               |                       | 3.5 x 8.5 x 7.5   | 5.0                       |
|                                      | 0.022                      | -322                              |                               |                       | 3.5 x 8.5 x 7.5   | 5.0                       |
|                                      | 0.033                      | -333                              |                               |                       | 3.5 x 8.5 x 7.5   | 5.0                       |
|                                      | 0.047                      | -347                              |                               |                       | 4.0 x 9.0 x 10.0  | 7.5                       |
|                                      | 0.068                      | -368                              |                               |                       | 4.0 x 9.0 x 10.0  | 7.5                       |
|                                      | 0.10                       | -410                              |                               |                       | 5.0 x 10.5 x 10.0   | 7.5                       |
|                                      | 0.15                       | -415                              |                               |                       | 5.0 x 11.0 x 12.5   | 10.0                      |
|                                      | 0.22                       | -422                              |                               |                       | 6.0 x 12.0 x 12.5   | 10.0                      |
|                                      | 0.33                       | -433                              |                               |                       | 6.0 x 12.0 x 17.5   | 15.0                      |
|                                      | 0.47                       | -447                              |                               |                       | 7.0 x 13.5 x 17.5   | 15.0                      |
|                                      | 0.68                       | -468                              |                               |                       | 8.5 x 15.0 x 17.5   | 15.0                      |
|                                      | 1.0                        | -510                              |                               |                       | 7.0 x 16.5 x 26.0   | 22.5                      |
|                                      | 1.5                        | -515                              |                               |                       | 10.0 x 19.5 x 26.0  | 22.5                      |
|                                      | 2.2                        | -522                              |                               |                       | 12.0 x 22.0 x 26.0  | 22.5                      |
|                                      | 3.3                        | -533                              |                               |                       | 13.0 x 23.0 x 31.0  | 27.5                      |
| 4.7                                  | -547                       | 15.0 x 25.0 x 31.5                | 27.5                          |                       |   |                           |
| 6.8                                  | -568                       | 14.5 x 24.5 x 41.5                | 37.5                          |                       |   |                           |
| 400                                  | 0.0068                     | -268                              | 40                            | 220 <sup>(2)</sup>    | 3.5 x 8.5 x 7.5   | 5.0                       |
|                                      | 0.010                      | -310                              |                               |                       | 3.5 x 8.5 x 7.5   | 5.0                       |
|                                      | 0.015                      | -315                              |                               |                       | 3.0 x 8.0 x 10.0  | 7.5                       |
|                                      | 0.022                      | -322                              |                               |                       | 4.0 x 9.0 x 10.0  | 7.5                       |
|                                      | 0.033                      | -333                              |                               |                       | 4.0 x 9.0 x 10.0  | 7.5                       |
|                                      | 0.047                      | -347                              |                               |                       | 5.0 x 10.5 x 10.0   | 7.5                       |
|                                      | 0.068                      | -368                              |                               |                       | 6.0 x 11.5 x 10.0   | 7.5                       |
|                                      | 0.10                       | -410                              |                               |                       | 5.0 x 11.0 x 17.5   | 15.0                      |
|                                      | 0.15                       | -415                              |                               |                       | 6.0 x 12.0 x 17.5   | 15.0                      |
|                                      | 0.22                       | -422                              |                               |                       | 7.0 x 13.5 x 17.5   | 15.0                      |
|                                      | 0.33                       | -433                              |                               |                       | 8.5 x 15.0 x 17.5   | 15.0                      |
|                                      | 0.47                       | -447                              |                               |                       | 7.0 x 16.5 x 26.0   | 22.5                      |
|                                      | 0.68                       | -468                              |                               |                       | 8.5 x 18.0 x 26.0   | 22.5                      |
|                                      | 1.0                        | -510                              |                               |                       | 10.0 x 19.5 x 26.0  | 22.5                      |
|                                      | 1.5                        | -515                              |                               |                       | 13.0 x 23.0 x 31.0  | 27.5                      |
|                                      | 2.2                        | -522                              |                               |                       | 15.0 x 25.0 x 31.5  | 27.5                      |
| 3.3                                  | -533                       | 18.0 x 28.0 x 31.5                | 27.5                          |                       |   |                           |
| 4.7                                  | -547                       | 18.0 x 32.5 x 41.0                | 37.5                          |                       |   |                           |
| 6.8                                  | -568                       | 21.5 x 38.5 x 43.0                | 37.5                          |                       |   |                           |
| 630                                  | 0.0010                     | -210                              | 63                            | 250 <sup>(2)</sup>    | 3.5 x 8.5 x 7.5   | 5.0                       |
|                                      | 0.0015                     | -215                              |                               |                       | 3.5 x 8.5 x 7.5   | 5.0                       |
|                                      | 0.0022                     | -222                              |                               |                       | 3.5 x 8.5 x 7.5   | 5.0                       |
|                                      | 0.0033                     | -233                              |                               |                       | 3.0 x 8.0 x 10.0  | 7.5                       |
|                                      | 0.0047                     | -247                              |                               |                       | 3.0 x 8.0 x 10.0  | 7.5                       |
|                                      | 0.0068                     | -268                              |                               |                       | 3.0 x 8.0 x 10.0  | 7.5                       |
|                                      | 0.010                      | -310                              |                               |                       | 3.0 x 8.0 x 10.0  | 7.5                       |
|                                      | 0.015                      | -315                              |                               |                       | 4.0 x 9.0 x 10.0  | 7.5                       |
|                                      | 0.022                      | -322                              |                               |                       | 4.0 x 10.0 x 12.5   | 10.0                      |
|                                      | 0.033                      | -333                              |                               |                       | 5.0 x 11.0 x 12.5   | 10.0                      |
|                                      | 0.047                      | -347                              |                               |                       | 6.0 x 12.0 x 12.5   | 10.0                      |
|                                      | 0.068                      | -368                              |                               |                       | 5.0 x 11.0 x 17.5   | 15.0                      |
|                                      | 0.10                       | -410                              |                               |                       | 6.0 x 12.0 x 17.5   | 15.0                      |
|                                      | 0.15                       | -415                              |                               |                       | 8.5 x 15.0 x 17.5   | 15.0                      |
|                                      | 0.22                       | -422                              |                               |                       | 10.0 x 16.5 x 17.5  | 15.0                      |
|                                      | 0.33                       | -433                              |                               |                       | 8.5 x 18.0 x 26.0   | 22.5                      |
|                                      | 0.47                       | -447                              |                               |                       | 10.0 x 19.5 x 26.0  | 22.5                      |
|                                      | 0.68                       | -468                              |                               |                       | 11.0 x 21.0 x 31.0  | 27.5                      |
|                                      | 1.0                        | -510                              |                               |                       | 13.0 x 23.0 x 31.0  | 27.5                      |
|                                      | 1.5                        | -515                              |                               |                       | 18.0 x 28.0 x 31.5  | 27.5                      |
| 2.2                                  | -522                       | 21.0 x 31.0 x 31.0                | 27.5                          |                       |   |                           |
| 3.3                                  | -533                       | 18.0 x 32.5 x 41.0                | 37.5                          |                       |   |                           |
| 4.7                                  | -547                       | 21.5 x 38.5 x 43.0                | 37.5                          |                       |   |                           |



| ELECTRICAL DATA         |              |                     |                 |                    |  |                     |
|-------------------------|--------------|---------------------|-----------------|--------------------|--|---------------------|
| U <sub>RDC</sub><br>(V) | CAP.<br>(µF) | CAPACITANCE<br>CODE | VOLTAGE<br>CODE | V <sub>AC</sub>    | DIMENSIONS <sup>(3)</sup><br>w x h x l<br>(mm) | PCM<br>(mm)         |
| 630                     | 0.010        | -310                | 63              | 400 <sup>(2)</sup> | 5.0 x 11.0 x 12.5                              | 10.0 <sup>(1)</sup> |
|                         | 0.015        | -315                |                 |                    | 6.0 x 12.0 x 12.5                              | 10.0 <sup>(1)</sup> |
|                         | 0.022        | -322                |                 |                    | 9.0 x 15.5 x 13.0                              | 10.0 <sup>(1)</sup> |
|                         | 0.033        | -333                |                 |                    | 6.0 x 12.0 x 17.5                              | 15.0 <sup>(1)</sup> |
|                         | 0.047        | -347                |                 |                    | 8.5 x 15.0 x 17.5                              | 15.0 <sup>(1)</sup> |
|                         | 0.068        | -368                |                 |                    | 10.0 x 16.5 x 17.5                             | 15.0 <sup>(1)</sup> |
|                         | 0.10         | -410                |                 |                    | 7.0 x 16.5 x 26.0                              | 22.5 <sup>(1)</sup> |
|                         | 0.15         | -415                |                 |                    | 10.0 x 19.5 x 26.0                             | 22.5 <sup>(1)</sup> |
|                         | 0.22         | -422                |                 |                    | 12.0 x 22.0 x 26.0                             | 22.5 <sup>(1)</sup> |
|                         | 0.33         | -433                |                 |                    | 15.5 x 26.5 x 26.5                             | 22.5 <sup>(1)</sup> |
|                         | 0.47         | -447                |                 |                    | 15.0 x 25.0 x 31.5                             | 27.5 <sup>(1)</sup> |
|                         | 0.68         | -468                |                 |                    | 18.0 x 28.0 x 31.5                             | 27.5 <sup>(1)</sup> |
|                         | 1.0          | -510                |                 |                    | 21.0 x 31.0 x 31.0                             | 27.5 <sup>(1)</sup> |
| 1000                    | 0.0047       | -247                | 10              | 500 <sup>(2)</sup> | 4.0 x 10.0 x 12.5                              | 10.0                |
|                         | 0.0068       | -268                |                 |                    | 4.0 x 10.0 x 12.5                              | 10.0                |
|                         | 0.010        | -310                |                 |                    | 5.0 x 11.0 x 12.5                              | 10.0                |
|                         | 0.015        | -315                |                 |                    | 6.0 x 12.0 x 12.5                              | 10.0                |
|                         | 0.022        | -322                |                 |                    | 5.0 x 11.0 x 17.5                              | 15.0                |
|                         | 0.033        | -333                |                 |                    | 6.0 x 12.0 x 17.5                              | 15.0                |
|                         | 0.047        | -347                |                 |                    | 8.5 x 15.0 x 17.5                              | 15.0                |
|                         | 0.068        | -368                |                 |                    | 10.0 x 16.5 x 17.5                             | 15.0                |
|                         | 0.10         | -410                |                 |                    | 7.0 x 16.5 x 26.0                              | 22.5                |
|                         | 0.15         | -415                |                 |                    | 10.0 x 19.5 x 26.0                             | 22.5                |
|                         | 0.22         | -422                |                 |                    | 12.0 x 22.0 x 26.0                             | 22.5                |
|                         | 0.33         | -433                |                 |                    | 13.0 x 23.0 x 31.0                             | 27.5                |
|                         | 0.47         | -447                |                 |                    | 15.0 x 25.0 x 31.5                             | 27.5                |
| 0.68                    | -468         | 18.0 x 28.0 x 31.5  | 27.5            |                    |  |                     |
| 1.0                     | -510         | 20.0 x 35.0 x 31.5  | 27.5            |                    |  |                     |
| 1.5                     | -515         | 18.0 x 32.5 x 41.5  | 37.5            |                    |  |                     |
| 1600                    | 0.0068       | -268                | 13              | 600 <sup>(2)</sup> | 5.0 x 11.0 x 17.5                              | 15.0                |
|                         | 0.010        | -310                |                 |                    | 6.0 x 12.0 x 17.5                              | 15.0                |
|                         | 0.015        | -315                |                 |                    | 7.0 x 13.5 x 17.5                              | 15.0                |
|                         | 0.022        | -322                |                 |                    | 8.5 x 15.0 x 17.5                              | 15.0                |
|                         | 0.033        | -333                |                 |                    | 10.0 x 16.5 x 17.5                             | 15.0                |
|                         | 0.047        | -347                |                 |                    | 8.5 x 18.0 x 26.0                              | 22.5                |
|                         | 0.068        | -368                |                 |                    | 10.0 x 19.5 x 26.0                             | 22.5                |
|                         | 0.10         | -410                |                 |                    | 12.0 x 22.0 x 26.0                             | 22.5                |
|                         | 0.15         | -415                |                 |                    | 13.0 x 23.0 x 31.0                             | 27.5                |
|                         | 0.22         | -422                |                 |                    | 18.0 x 28.0 x 31.5                             | 27.5                |
|                         | 0.33         | -433                |                 |                    | 21.0 x 31.0 x 31.0                             | 27.5                |
|                         | 0.47         | -447                |                 |                    | 20.0 x 35.0 x 31.5                             | 27.5                |
|                         | 0.68         | -468                |                 |                    | 18.5 x 35.5 x 43.0                             | 37.5                |
| 2000                    | 0.0010       | -210                | 20              | 700 <sup>(2)</sup> | 5.0 x 11.0 x 17.5                              | 15                  |
|                         | 0.0015       | -215                |                 |                    | 5.0 x 11.0 x 17.5                              | 15                  |
|                         | 0.0022       | -222                |                 |                    | 5.0 x 11.0 x 17.5                              | 15                  |
|                         | 0.0033       | -233                |                 |                    | 5.0 x 11.0 x 17.5                              | 15                  |
|                         | 0.0047       | -247                |                 |                    | 5.0 x 11.0 x 17.5                              | 15                  |
|                         | 0.0068       | -268                |                 |                    | 6.0 x 12.0 x 17.5                              | 15                  |
|                         | 0.010        | -310                |                 |                    | 6.0 x 15.5 x 26.0                              | 22.5                |
|                         | 0.015        | -315                |                 |                    | 6.0 x 15.5 x 26.0                              | 22.5                |
|                         | 0.022        | -322                |                 |                    | 7.0 x 16.5 x 26.0                              | 22.5                |
|                         | 0.033        | -333                |                 |                    | 8.5 x 18.0 x 26.0                              | 22.5                |
|                         | 0.047        | -347                |                 |                    | 10.0 x 19.5 x 26.0                             | 22.5                |

**Notes**

- Further C-values upon request
- Please refer to X-capacitors in our catalog "RFI Suppression Components"
- <sup>(1)</sup> Ordering code -2M (e.g. MKP1840 410 635-2M)
- <sup>(2)</sup> Not suitable for mains applications
- <sup>(3)</sup> For tolerances see chapter "Space Requirements for Printed-Circuit Board Applications and Dimension Tolerances"

**RECOMMENDED PACKAGING**

| LETTER CODE | TYPE OF PACKAGING | HEIGHT (H) (mm) | REEL DIAMETER (mm) | ORDERING CODE EXAMPLES | PITCH ≤ 15 | PITCH 22.5 TO 27.5 | PITCH 37.5 |
|-------------|-------------------|-----------------|--------------------|------------------------|------------|--------------------|------------|
| G           | Ammo              | 18.5            | S <sup>(1)</sup>   | MKP1840410404MG        | x          | -                  | -          |
| W           | Reel              | 18.5            | 350                | MKP1840410404MW        | x          | -                  | -          |
| V           | Reel              | 18.5            | 500                | MKP1840510254MV        | -          | x                  | -          |
| G           | Ammo              | 18.5            | L <sup>(2)</sup>   | MKP1840510254MG        | -          | x                  | -          |
| -           | Bulk              | -               | -                  | MKP1840510254M         | x          | x                  | x          |

**Notes**

(1) S = box size 55 mm x 210 mm x 340 mm (w x h x l)

(2) L = box size 60 mm x 360 mm x 510 mm (w x h x l)

**EXAMPLE OF ORDERING CODE**

| TYPE    | CAPACITANCE CODE | VOLTAGE CODE | TOLERANCE CODE | MINI | PACKAGING CODE |
|---------|------------------|--------------|----------------|------|----------------|
| MKP1840 | 447              | 63           | 4              | M    | G              |

**Note**

- Tolerance codes: 4 = 5 % (J); 3 = 2.5 % (H)

**METALLIZED POLYPROPYLENE FILM CAPACITOR, MKP1840 PCM5, MINI VERSION (-5M)****ELECTRICAL DATA**

| U <sub>RDC</sub> (V) | CAP. (μF) | CAPACITANCE CODE | VOLTAGE CODE | V <sub>AC</sub>    | DIMENSIONS <sup>(2)</sup> w x h x l (mm) | PCM (mm) | d <sub>t</sub> ± 0.05 (mm) |
|----------------------|-----------|------------------|--------------|--------------------|--|----------|----------------------------|
| 250                  | 0.047     | -347             | 25           | 160                | 4.5 x 9.0 x 7.2                          | 5.0      | 0.5                        |
|                      | 0.068     | -368             |              |                    | 6.0 x 11.0 x 7.2                         |          |                            |
|                      | 0.10      | -410             |              |                    | 6.0 x 11.0 x 7.2                         |          |                            |
| 400                  | 0.015     | -315             | 40           | 220 <sup>(1)</sup> | 4.5 x 9.0 x 7.2                          | 5.0      | 0.5                        |
|                      | 0.022     | -322             |              |                    | 6.0 x 11.0 x 7.2                         |          |                            |
|                      | 0.033     | -333             |              |                    | 6.0 x 11.0 x 7.2                         |          |                            |
| 630                  | 0.0033    | -233             | 63           | 250 <sup>(1)</sup> | 3.5 x 8.0 x 7.2                          | 5.0      | 0.5                        |
|                      | 0.0047    | -247             |              |                    | 3.5 x 8.0 x 7.2                          |          |                            |
|                      | 0.0068    | -268             |              |                    | 3.5 x 8.0 x 7.2                          |          |                            |
|                      | 0.010     | -310             |              |                    | 4.5 x 9.0 x 7.2                          |          |                            |
|                      | 0.015     | -315             |              |                    | 6.0 x 11.0 x 7.2                         |          |                            |

**Notes**

- Further C-values upon request

(1) Not suitable for mains applications

(2) For tolerances see chapter "Space Requirements for Printed-Circuit Board Applications and Dimension Tolerances"

**RECOMMENDED PACKAGING**

| LETTER CODE | TYPE OF PACKAGING | HEIGHT (H) (mm) | REEL DIAMETER (mm) | ORDERING CODE EXAMPLES | PITCH 5 |
|-------------|-------------------|-----------------|--------------------|------------------------|---------|
| G           | Ammo              | 18.5            | S <sup>(2)</sup>   | MKP18403104045MG       | x       |
| W           | Reel              | 18.5            | 350                | MKP18403104045MW       | x       |
| -           | Bulk              | -               | -                  | MKP18403104045M        | x       |

**Note**

(1) S = box size 55 mm x 210 mm x 340 mm (w x h x l)

**EXAMPLE OF ORDERING CODE**

| TYPE    | CAPACITANCE CODE | VOLTAGE CODE | TOLERANCE CODE | MINI | PACKAGING CODE |
|---------|------------------|--------------|----------------|------|----------------|
| MKP1840 | 347              | 25           | 4              | 5M   | G              |

**Note**

- Tolerance codes: 4 = 5 % (J); 3 = 2.5 % (H)



## MOUNTING

### Normal Use

The capacitors are designed for mounting on printed-circuit boards. The capacitors packed in bandoleers are designed for mounting in printed-circuit boards by means of automatic insertion machines.

For detailed tape specifications refer to packaging information [www.vishay.com/doc?28139](http://www.vishay.com/doc?28139) or end of catalog

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

In order to withstand vibration and shock tests, it must be ensure that the stand-off pips are in good contact with the printed-circuit board:

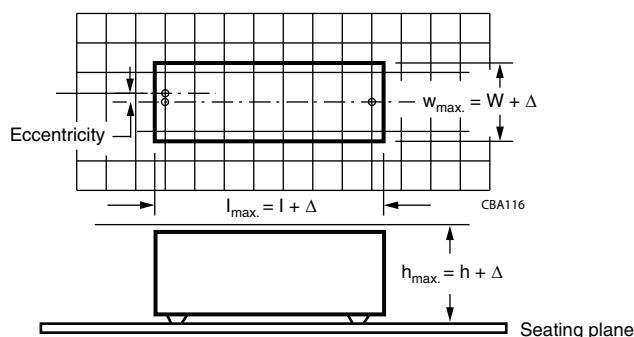
- For pitches  $\leq 15$  mm capacitors shall be mechanically fixed by the leads
- For larger pitches the capacitors shall be mounted in the same way and the body clamped

### Space Requirements for Printed Circuit-Board Applications and Dimension Tolerances

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  $\leq 15$  mm,  $\Delta w = \Delta l = 0.3$  mm and  $\Delta h = 0.1$  mm
- For products with  $15$  mm  $<$  pitch  $\leq 27.5$  mm,  $\Delta w = \Delta l = 0.5$  mm and  $\Delta h = 0.1$  mm
- For products with pitch =  $37.5$  mm,  $\Delta w = \Delta l = 0.7$  mm;  $\Delta h = 0.5$  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:

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

- For products with pitch  $\leq 10$  mm,  $\Delta l = 0.3$  mm and  $\Delta w = \Delta h = 0.3$  mm
- For products with pitch =  $15$  mm,  $\Delta l = 0.5$  mm and  $\Delta w = \Delta h = 0.5$  mm
- For products with  $15$  mm  $<$  pitch  $\leq 27.5$  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

## SOLDERING CONDITIONS

For general soldering conditions and wave soldering profile, we refer to the application note:

“Soldering Guidelines for Film Capacitors”: [www.vishay.com/doc?28171](http://www.vishay.com/doc?28171)

### Storage Temperature

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

### Ratings and Characteristics Reference Conditions

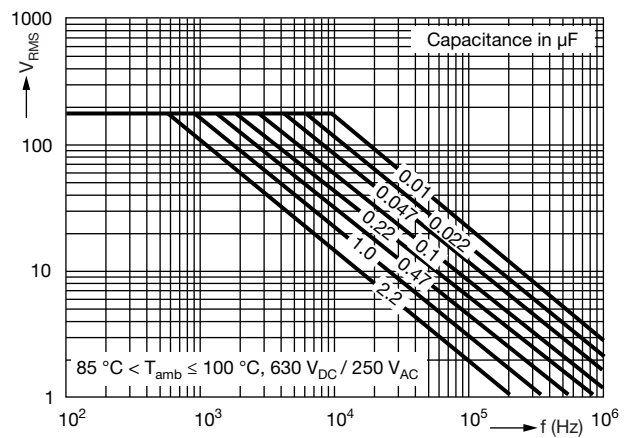
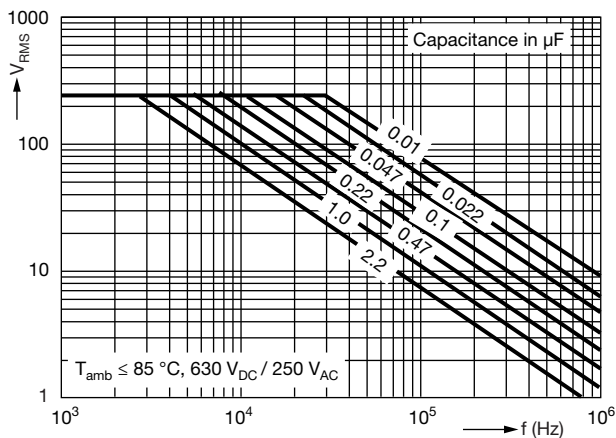
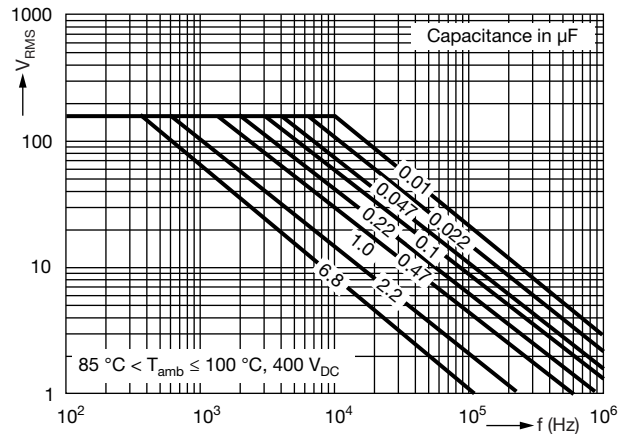
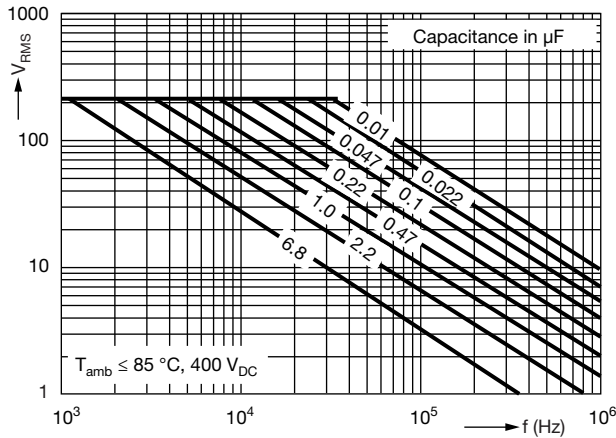
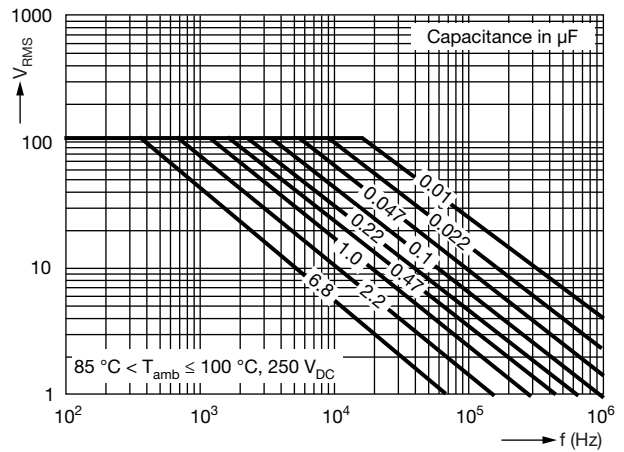
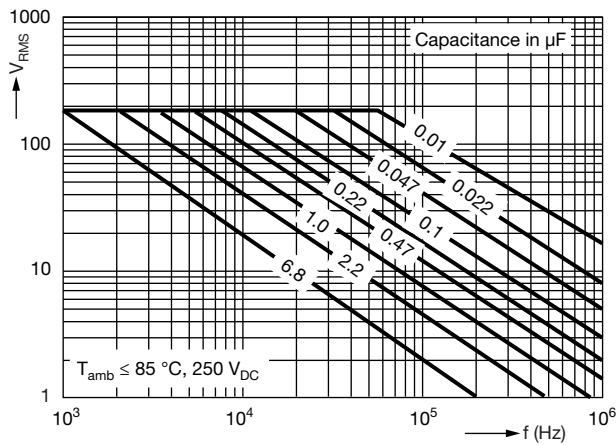
Unless otherwise specified, all electrical values apply to an ambient free temperature of  $23$  °C  $\pm 1$  °C, an atmospheric pressure of  $86$  kPa to  $106$  kPa and a relative humidity of  $50$  %  $\pm 2$  %.

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



**CHARACTERISTICS**

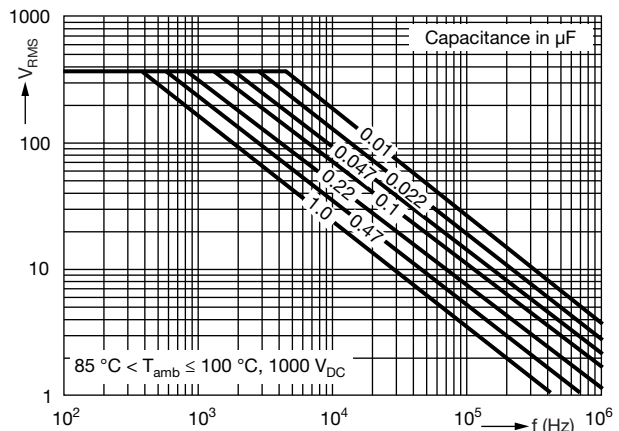
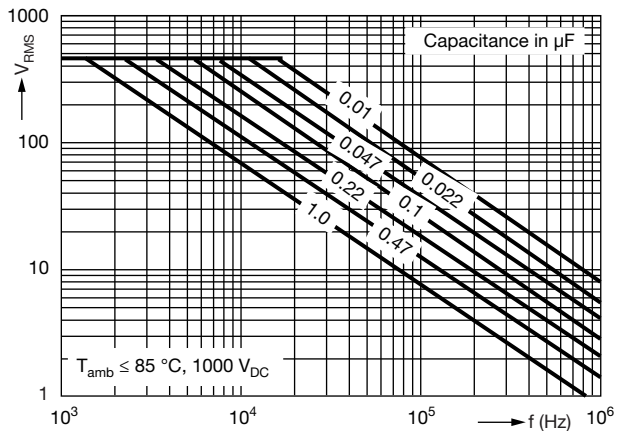
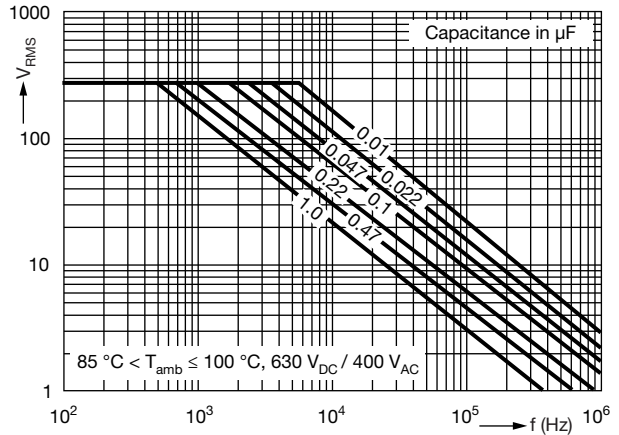
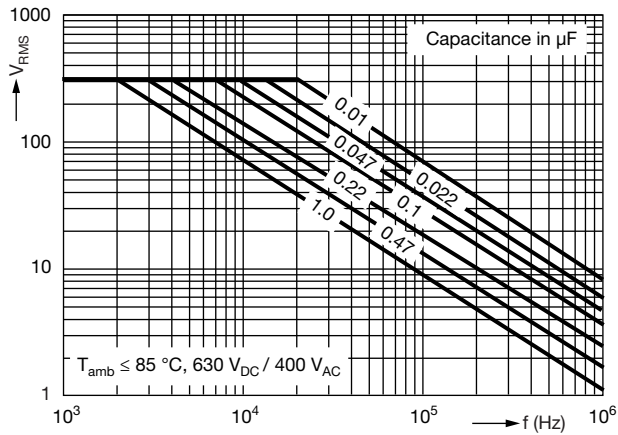
**MAX. RMS VOLTAGE AS A FUNCTION OF FREQUENCY**





**CHARACTERISTICS**

**MAX. RMS VOLTAGE AS A FUNCTION OF FREQUENCY**



| <b>HEAT CONDUCTIVITY (G) AS A FUNCTION OF ORIGINAL PITCH AND CAPACITOR BODY THICKNESS IN mW/°C</b> |                                  |                     |                    |                    |                      |                      |                      |
|--|----------------------------------|---------------------|--------------------|--------------------|----------------------|----------------------|----------------------|
| <b><math>W_{max.}</math><br/>(mm)</b>  | <b>HEAT CONDUCTIVITY (mW/°C)</b> |                     |                    |                    |                      |                      |                      |
|  | <b>PITCH 5 mm</b>                | <b>PITCH 7.5 mm</b> | <b>PITCH 10 mm</b> | <b>PITCH 15 mm</b> | <b>PITCH 22.5 mm</b> | <b>PITCH 27.5 mm</b> | <b>PITCH 37.5 mm</b> |
| 3.0  | -                                | 4.0                 | -                  | -                  | -                    | -                    | -                    |
| 3.5  | 3.5                              | -                   | -                  | -                  | -                    | -                    | -                    |
| 4.0  | -                                | 5.0                 | 6.0                | -                  | -                    | -                    | -                    |
| 4.5  | 4.5                              | -                   | -                  | -                  | -                    | -                    | -                    |
| 5.0  | 5.0                              | 6.5                 | -                  | -                  | -                    | -                    | -                    |
| 6.0  | 5.5                              | 7.5                 | 9.0                | 11.5               | 19.5                 | -                    | -                    |
| 7.0  | -                                | -                   | -                  | 13.5               | 22.0                 | -                    | -                    |
| 8.5  | -                                | -                   | -                  | 15.0               | 16.5                 | -                    | -                    |
| 9.0  | -                                | -                   | 14.0               | -                  | -                    | -                    | -                    |
| 10.0   | -                                | -                   | -                  | 19.0               | 29.0                 | -                    | -                    |
| 11.0   | -                                | -                   | -                  | -                  | -                    | 36.5                 | -                    |
| 12.0   | -                                | -                   | -                  | -                  | 34.5                 | -                    | -                    |
| 13.0   | -                                | -                   | -                  | -                  | -                    | 42.5                 | -                    |
| 15.0   | -                                | -                   | -                  | -                  | -                    | 49.0                 | -                    |
| 15.5   | -                                | -                   | -                  | -                  | 45.0                 | -                    | -                    |
| 18.0   | -                                | -                   | -                  | -                  | -                    | 57.0                 | -                    |
| 18.5   | -                                | -                   | -                  | -                  | -                    | -                    | 89.0                 |
| 20.0   | -                                | -                   | -                  | -                  | -                    | 73.0                 | -                    |
| 21.0   | -                                | -                   | -                  | -                  | -                    | 68.0                 | -                    |
| 21.5   | -                                | -                   | -                  | -                  | -                    | -                    | 102.0                |





**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.

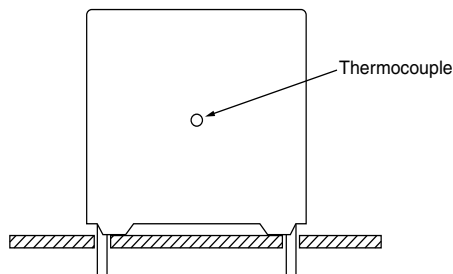
The power dissipation can be calculated according type detail specification “HQN-384-01/101: Technical Information Film Capacitors” with the typical tgδ of the curves.

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

- ΔT = component temperature rise (°C)
- P = power dissipation of the component (mW)
- G = heat conductivity of the component (mW/°C)

**MEASURING THE COMPONENT TEMPERATURE**

A thermocouple must be attached to the capacitor body as in:



The temperature is measured in unloaded (T<sub>amb</sub>) and maximum loaded condition (T<sub>C</sub>).

The temperature rise is given by ΔT = T<sub>C</sub> - T<sub>amb</sub>.

To avoid radiation or convection, the capacitor should be tested in a wind-free box.

**APPLICATION NOTE AND LIMITING CONDITIONS**

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)

These capacitors are not suitable for mains applications as across-the-line capacitors without additional protection, as described hereunder. 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 peak voltage (U<sub>p</sub>) shall not be greater than the rated DC voltage (U<sub>RDC</sub>)
2. The peak-to-peak voltage (U<sub>p-p</sub>) shall not be greater than the maximum (U<sub>p-p</sub>) to avoid the ionisation inception level
3. The voltage peak slope (dU/dt) shall not exceed the rated voltage pulse slope in an RC-circuit at rated voltage and without ringing. If the pulse voltage is lower than the rated DC voltage, the rated voltage pulse slope may be multiplied by U<sub>RDC</sub> and divided by the applied voltage.

For all other pulses following equation must be fulfilled:

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

T is the pulse duration.

4. The maximum component surface temperature rise must be lower than the limits (see graph “Max. allowed component temperature rise”).
5. Since in circuits used at voltages over 280 V peak-to-peak the risk for an intrinsically active flammability after a capacitor breakdown (short circuit) increases, it is recommended that the power to the component is limited to 100 times the values mentioned in the table: “Heat conductivity”
6. When using these capacitors as across-the-line capacitor in the input filter for mains applications or as series connected with an impedance to the mains the applicant must guarantee that the following conditions are fulfilled in any case (spikes and surge voltages from the mains included).

| <b>VOLTAGE CONDITIONS FOR 6 ABOVE</b>            |                                |  |
|--|--------------------------------|--|
| <b>ALLOWED VOLTAGES</b>                          | <b>T<sub>amb</sub> ≤ 85 °C</b> | <b>85 °C &lt; T<sub>amb</sub> ≤ 100 °C</b> |
| Maximum continuous RMS voltage                   | U <sub>RAC</sub>               | U <sub>RAC</sub>                           |
| Maximum temperature RMS-overvoltage (< 24 h)     | 1.25 x U <sub>RAC</sub>        | 0.875 x U <sub>RAC</sub>                   |
| Maximum peak voltage (V <sub>O-P</sub> ) (< 2 s) | 1.6 x U <sub>RDC</sub>         | 1.1 x U <sub>RDC</sub>                     |



**INSPECTION REQUIREMENTS**

**General Notes**

Sub-clause numbers of tests and performance requirements refer to the “Sectional Specification, Publication IEC 60384-2 and Specific Reference Data”.

| <b>GROUP C INSPECTION REQUIREMENTS</b>              |  |   |
|---|--|---|
| <b>SUB-CLAUSE NUMBER AND TEST</b>                   | <b>CONDITIONS</b>  | <b>PERFORMANCE REQUIREMENTS</b>   |
| <b>SUB-GROUP C1A PART OF SAMPLE OF SUB-GROUP C1</b> |  |   |
| 4.1 Dimensions (detail)                             |  | As specified in chapter “General Data” of this specification  |
| 4.3.1 Initial measurements                          | Capacitance<br>Tangent of loss angle at<br>$C \leq 1 \mu\text{F}$ at 10 kHz<br>$C > 1 \mu\text{F}$ at 1 kHz  |   |
| 4.3 Robustness of terminations                      | Tensile and bending  | No visible damage   |
| 4.4 Resistance to soldering heat                    | Method: 1A<br>Solder bath: $280 \text{ }^\circ\text{C} \pm 5 \text{ }^\circ\text{C}$<br>Duration: 5 s  |   |
| 4.14 Component solvent resistance                   | Isopropylalcohol at room temperature<br>Method: 2<br>Immersion time: $5 \text{ min} \pm 0.5 \text{ min}$<br>Recovery time: min. 1 h, max. 2 h  |   |
| 4.4.2 Final measurements                            | Visual examination<br><br>Capacitance<br><br>Tangent of loss angle   | No visible damage<br>Legible marking<br><br>$ \Delta C/C  \leq 2 \%$ of the value measured initially<br><br>Increase of $\tan \delta: \leq 0.002$<br>Compared to values measured in 4.3.1 |
| <b>SUB-GROUP C1B PART OF SAMPLE OF SUB-GROUP C1</b> |  |   |
| 4.6.1 Initial measurements                          | Capacitance<br>Tangent of loss angle at<br>$C \leq 1 \mu\text{F}$ at 10 kHz<br>$C > 1 \mu\text{F}$ at 1 kHz  | No visible damage   |
| 4.15 Solvent resistance of the marking              | Isopropylalcohol at room temperature<br>Method: 1<br>Rubbing material: cotton wool<br>Immersion time: $5 \text{ min} \pm 0.5 \text{ min}$  | No visible damage<br>Legible marking  |
| 4.6 Rapid change of temperature                     | $\theta A$ = lower category temperature<br>$\theta B$ = upper category temperature<br>5 cycles<br>Duration $t = 30 \text{ min}$  |   |
| 4.7 Vibration                                       | Visual examination<br>Mounting:<br>see section “Mounting” of this specification<br>Procedure B4<br>Frequency range: 10 Hz to 55 Hz<br>Amplitude: 0.75 mm or<br>Acceleration $98 \text{ m/s}^2$<br>(whichever is less severe)<br>Total duration 6 h | No visible damage<br>Legible marking  |
| 4.7.2 Final inspection                              | Visual examination   | No visible damage   |
| 4.9 Shock   | Mounting:<br>see section “Mounting” for more information<br>Pulse shape: half sine<br>Acceleration: $490 \text{ m/s}^2$<br>Duration of pulse: 11 ms  |   |



| <b>GROUP C INSPECTION REQUIREMENTS</b>                                     |   |   |
|--|---|---|
| <b>SUB-CLAUSE NUMBER AND TEST</b>  | <b>CONDITIONS</b>   | <b>PERFORMANCE REQUIREMENTS</b>   |
| <b>SUB-GROUP C1B PART OF SAMPLE OF SUB-GROUP C1</b>                        |   |   |
| 4.9.3 Final measurements   | Visual examination<br><br>Capacitance<br><br>Tangent of loss angle<br><br>Insulation resistance | No visible damage<br><br>$ \Delta C/C  \leq 2\%$ of the value measured in 4.6.1<br><br>Increase of $\tan \delta \leq 0.002$<br>Compared to values measured in 4.6.1<br><br>As specified in section "Insulation Resistance" of this specification  |
| <b>SUB-GROUP C1 COMBINED SAMPLE OF SPECIMENS OF SUB-GROUPS C1A AND C1B</b> |   |   |
| 4.10 Climatic sequence   |   |   |
| 4.10.2 Dry heat  | Temperature: upper category temperature<br>Duration: 16 h                                       |   |
| 4.10.3 Damp heat cyclic<br>Test Db, first cycle                            |   |   |
| 4.10.4 Cold  | Temperature: lower category temperature<br>Duration: 2 h  |   |
| 4.10.6 Damp heat cyclic<br>Test Db, remaining cycles                       |   |   |
| 4.10.6.2 Final measurements  | Visual examination<br><br>Capacitance<br><br>Tangent of loss angle<br><br>Insulation resistance | No visible damage<br>Legible marking<br><br>$ \Delta C/C  \leq 3\%$ of the value measured in 4.4.2 or 4.9.3<br><br>Increase of $\tan \delta: \leq 0.003$<br>Compared to values measured in 4.3.1 or 4.6.1<br><br>$\geq 50\%$ of values specified in section "Insulation Resistance" of this specification |
| <b>SUB-GROUP C2</b>  |   |   |
| 4.11 Damp heat steady state  | 56 days; 40 °C; 90 % to 95 % RH<br>no load  |   |
| 4.11.1 Initial measurements  | Tangent of loss angle at 1 kHz  |   |
| 4.11.3 Final measurements  | Visual examination<br><br>Capacitance<br><br>Tangent of loss angle<br><br>Insulation resistance | No visible damage<br>Legible marking<br><br>$ \Delta C/C  \leq 3\%$ of the value measured in 4.11.1.<br><br>Increase of $\tan \delta \leq 0.002$<br>Compared to values measured in 4.11.1<br><br>$\geq 50\%$ of values specified in section "Insulation Resistance" of this specification                 |



| GROUP C INSPECTION REQUIREMENTS   |  |  |
|-----------------------------------|--|--|
| SUB-CLAUSE NUMBER AND TEST        | CONDITIONS   | PERFORMANCE REQUIREMENTS   |
| <b>SUB-GROUP C3</b>               |  |  |
| 4.12 Endurance                    | Duration: 2000 h<br>1.25 x U <sub>RDC</sub> at 85 °C<br>0.875 x U <sub>RDC</sub> at 100 °C                             |  |
| 4.12.1 Initial measurements       | Capacitance<br>Tangent of loss angle at<br>C > 1 µF at 1 kHz<br>C ≤ 1 µF at 10 kHz                                     |  |
| 4.12.5 Final measurements         | Visual examination   | No visible damage<br>Legible marking   |
|                                   | Capacitance  | ΔC/C  ≤ 5 % for C > 10 nF<br> ΔC/C  ≤ 8 % for C ≤ 10 nF<br>Compared to values measured in 4.12.1   |
|                                   | Tangent of loss angle  | Increase of tan δ:<br>≤ 0.002 C > 1 µF at 1 kHz<br>≤ 0.004 C ≤ 1 µF at 10 kHz<br>Compared to values measured in 4.12.1                                     |
|                                   | Insulation resistance  | ≥ 50 % of values specified in section "Insulation Resistance" of this specification  |
| <b>SUB-GROUP C4</b>               |  |  |
| 4.2.6 Temperature characteristics |  |  |
| Initial measurements              | Capacitance  |  |
| Intermediate measurements         | Capacitance at lower category temperature<br>Capacitance at 20 °C<br>Capacitance at upper category temperature         | For -55 °C to +20 °C:<br>0 % ≤  ΔC/C  ≤ 2 % or<br>For 20 °C to 85 °C<br>-3 % ≤  ΔC/C  ≤ 0 %<br>As specified in section "Capacitance" of this specification |
| Final measurements                | Capacitance<br>Insulation resistance   | As specified in section "Insulation Resistance" of this specification  |
| <b>SUB-GROUP C4</b>               |  |  |
| 4.13 Charge and discharge         | 10 000 cycles<br>Charged to U <sub>RDC</sub><br>Discharge resistance:<br>$R = \frac{U_R}{1.5 \times C \times (dU/dt)}$ |  |
| 4.13.1 Initial measurements       | Capacitance<br>Tangent of loss angle at<br>C ≤ 1 µF at 10 kHz<br>C > 1 µF at 1 kHz                                     |  |
| 4.13.3 Final measurements         | Capacitance  | ΔC/C  ≤ 3 % compared to values measured in 4.13.1  |
|                                   | Tangent of loss angle  | Increase of tan δ:<br>≤ 0.002 C > 1 µF at 1 kHz<br>≤ 0.005 C ≤ 1 µF at 10 kHz<br>Compared to values measured in 4.13.1                                     |
|                                   | Insulation resistance  | ≥ 50 % of values specified in section "Insulation Resistance" of this specification  |



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