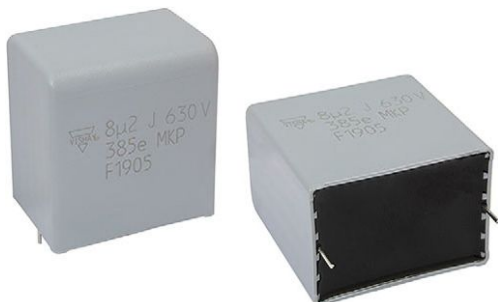


# THB AC and Pulse Metallized Polypropylene Film Capacitors

## High Temperature AEC-Q200 Qualified



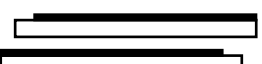
### FEATURES

- AEC-Q200 qualified (rev. D)
- THB 60 °C 93 % RH for 56 days at rated voltage
- High temperature capabilities, up to 125 °C
- Customization on request
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

### APPLICATIONS

- Hybrid and electrical vehicles applications
- On-board and inductive charging systems
  - BMS (battery management)
  - High pulse and high frequency currents
  - Snubbing
  - Resonant converters

| QUICK REFERENCE DATA                                     |                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rated capacitance range (E12 series)                     | 0.001 $\mu$ F to 15 $\mu$ F                                                                                                                                                                                                                                                                                                     |
| Capacitance tolerance                                    | $\pm 5\%$ / $\pm 10\%$                                                                                                                                                                                                                                                                                                          |
| Rated voltage range, $U_{RDC}$                           | 400 V <sub>DC</sub> , 630 V <sub>DC</sub> , 850 V <sub>DC</sub> , 1000 V <sub>DC</sub> , 1250 V <sub>DC</sub> , 1600 V <sub>DC</sub> , 2000 V <sub>DC</sub> , 2500 V <sub>DC</sub>                                                                                                                                              |
| Permissible AC voltage                                   | 200 V <sub>AC</sub> , 220 V <sub>AC</sub> , 300 V <sub>AC</sub> , 350 V <sub>AC</sub> , 450 V <sub>AC</sub> , 550 V <sub>AC</sub> , 700 V <sub>AC</sub> , 800 V <sub>AC</sub>                                                                                                                                                   |
| Climatic testing class                                   | 40 / 105 / 56                                                                                                                                                                                                                                                                                                                   |
| Rated temperature                                        | 85 °C                                                                                                                                                                                                                                                                                                                           |
| Max. operation temperature                               | 105 °C up to 125 °C observing voltage derating                                                                                                                                                                                                                                                                                  |
| Reference standards                                      | IEC 60384-17, AEC-Q200 qualified (rev. D) up to 105 °C                                                                                                                                                                                                                                                                          |
| Dielectric                                               | Polypropylene film                                                                                                                                                                                                                                                                                                              |
| Electrodes                                               | Metallized                                                                                                                                                                                                                                                                                                                      |
| Construction                                             | <div> Mono construction (for <math>\leq 630</math> V<sub>DC</sub>)  </div> <div> Series construction (for <math>&gt; 630</math> V<sub>DC</sub>)  </div> |
| Encapsulation                                            | Plastic case, epoxy resin sealed, flame retardant UL-class 94 V-0                                                                                                                                                                                                                                                               |
| Leads                                                    | Tinned wire                                                                                                                                                                                                                                                                                                                     |
| Withstanding DC voltage between terminals <sup>(1)</sup> | 1.6 $U_{RDC}$ for 60 s (maximum rise time 1000 V/s; cut off current 10 mA)                                                                                                                                                                                                                                                      |
| Test voltage between terminals and case                  | 1.4 $U_{RAC}$ + 2000 V <sub>DC</sub> for 60 s                                                                                                                                                                                                                                                                                   |
| Insulation resistance                                    | RC between leads, after 1 min:<br>for $U_{RDC} < 500$ V measuring voltage 100 V<br>for $U_{RDC} \geq 500$ V measuring voltage 500 V<br>$> 100$ G $\Omega$ for $C \leq 0.33$ $\mu$ F<br>$> 30\,000$ s for $C > 0.33$ $\mu$ F                                                                                                     |
| Marking                                                  | C-value, tolerance, rated voltage, code for dielectric material, manufacturer location, manufacturer's type, manufacturer's logo, year and week                                                                                                                                                                                 |

### Notes

- For more detailed data and test requirements, contact [dc-film@vishay.com](mailto:dc-film@vishay.com)
- <sup>(1)</sup> See document "Voltage Proof Test for Metallized Capacitors" [www.vishay.com/doc?28169](http://www.vishay.com/doc?28169)

**VOLTAGE RATINGS AND TEMPERATURE****VOLTAGE RATINGS  $T_{amb} = 85\text{ }^{\circ}\text{C}$** 

|                                                                                  |     |      |      |      |      |      |                     |      |
|----------------------------------------------------------------------------------|-----|------|------|------|------|------|---------------------|------|
| Rated DC voltage $U_{RDC}$                                                       | 400 | 630  | 850  | 1000 | 1250 | 1600 | 2000                | 2500 |
| Rated AC voltage $U_{RAC}$                                                       | 200 | 220  | 300  | 350  | 450  | 550  | 700 <sup>(1)</sup>  | 800  |
| Rated peak to peak voltage $V_{p-p}$ ( $2 \times U_{RAC} \times \sqrt{2}$ )      | 560 | 620  | 850  | 1000 | 1250 | 1600 | 2000 <sup>(1)</sup> | 2250 |
| Peak voltage $V_{o-p}$ ( $U_{RDC} \times 1.6$ )                                  | 640 | 1008 | 1360 | 1600 | 2000 | 2560 | 3200                | 4000 |
| Maximum temporary RMS over voltage ( $< 24\text{ h}$ ) ( $1.25 \times U_{RAC}$ ) | 250 | 275  | 375  | 438  | 563  | 688  | 875                 | 1000 |

**VOLTAGE RATINGS  $85\text{ }^{\circ}\text{C} < T_{amb} \leq 105\text{ }^{\circ}\text{C}$** 

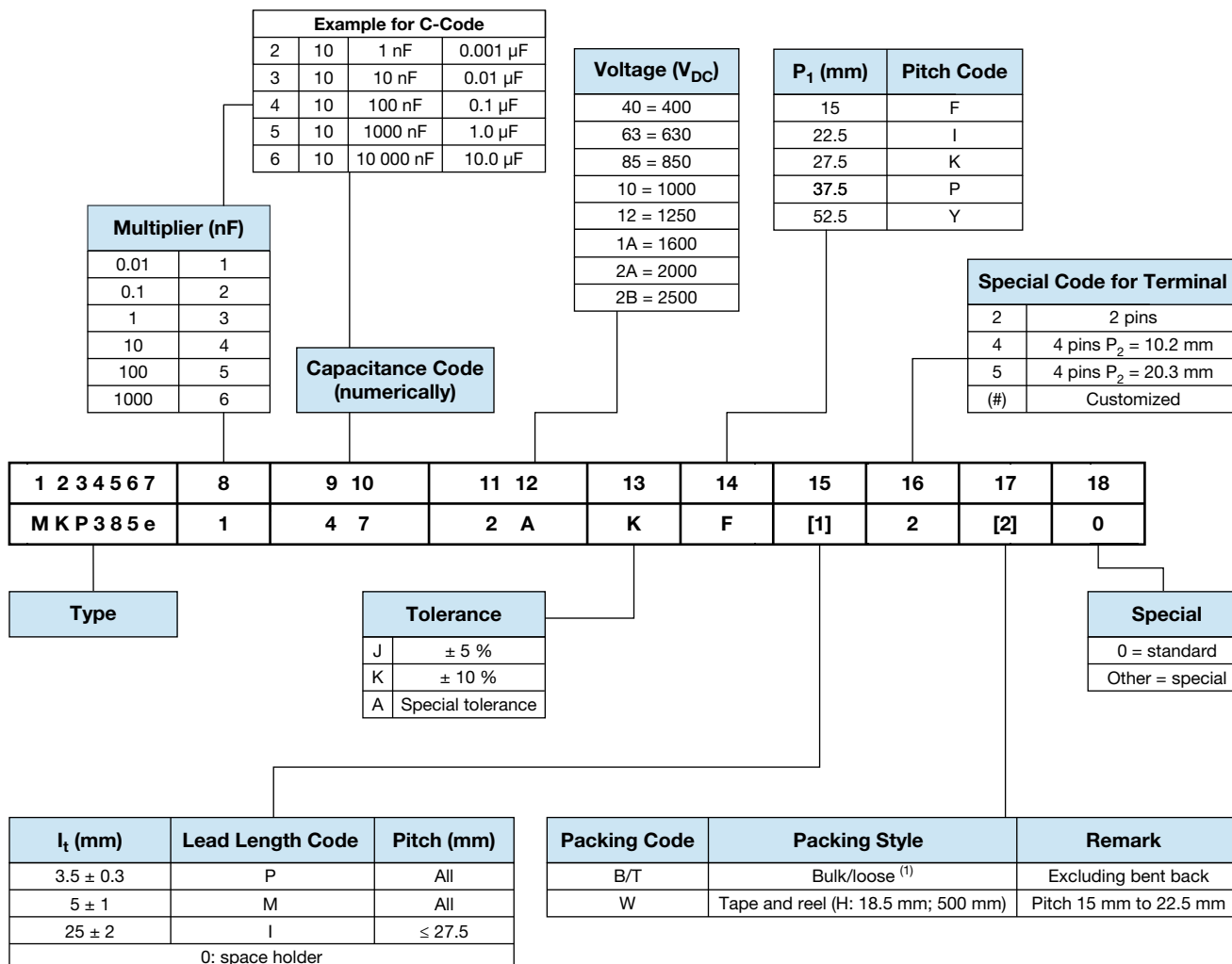
|                                                                                   |     |     |     |      |      |      |                     |      |
|-----------------------------------------------------------------------------------|-----|-----|-----|------|------|------|---------------------|------|
| $U_{OPDC}$ ( $U_{RDC} \times 0.7$ )                                               | 280 | 441 | 595 | 700  | 875  | 1120 | 1400                | 1750 |
| $U_{OPAC}$ ( $U_{RAC} \times 0.7$ )                                               | 140 | 154 | 210 | 245  | 315  | 385  | 490 <sup>(2)</sup>  | 560  |
| Rated peak to peak voltage $V_{p-p}$ ( $2 \times U_{OPAC} \times \sqrt{2}$ )      | 396 | 436 | 594 | 693  | 891  | 1089 | 1386 <sup>(2)</sup> | 1584 |
| Peak voltage $V_{o-p}$ ( $U_{RDC} \times 1.1$ )                                   | 440 | 693 | 935 | 1100 | 1375 | 1760 | 2200                | 2750 |
| Maximum temporary RMS over voltage ( $< 24\text{ h}$ ) ( $0.875 \times U_{RAC}$ ) | 175 | 193 | 263 | 306  | 394  | 481  | 613 <sup>(2)</sup>  | 700  |

**VOLTAGE RATINGS  $105\text{ }^{\circ}\text{C} < T_{amb} \leq 125\text{ }^{\circ}\text{C}$  (for limited time  $< 500\text{ h}$ )**

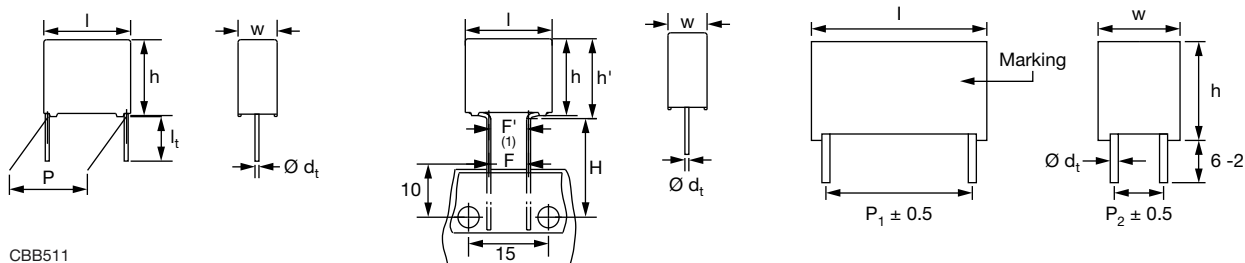
|                                                                                   |     |     |     |     |      |      |                    |      |
|-----------------------------------------------------------------------------------|-----|-----|-----|-----|------|------|--------------------|------|
| $U_{OPDC}$ ( $U_{RDC} \times 0.5$ )                                               | 200 | 315 | 425 | 500 | 625  | 800  | 1000               | 1250 |
| $U_{OPAC}$ ( $U_{RAC} \times 0.5$ )                                               | 100 | 110 | 150 | 175 | 225  | 275  | 350 <sup>(3)</sup> | 400  |
| Rated peak to peak voltage $V_{p-p}$ ( $2 \times U_{OPAC} \times \sqrt{2}$ )      | 283 | 311 | 424 | 495 | 636  | 778  | 990 <sup>(3)</sup> | 1131 |
| Peak voltage $V_{o-p}$ ( $U_{RDC} \times 0.8$ )                                   | 320 | 504 | 680 | 800 | 1000 | 1280 | 1600               | 2000 |
| Maximum temporary RMS over voltage ( $< 24\text{ h}$ ) ( $0.625 \times U_{RAC}$ ) | 125 | 138 | 188 | 219 | 281  | 344  | 438 <sup>(3)</sup> | 500  |

**Notes**

- (1) Rated AC voltage is 600 V<sub>AC</sub> and rated peak to peak voltage is 1700 V<sub>AC</sub> for pitch 37.5 mm
- (2)  $U_{OPAC}$  ( $U_{RAC} \times 0.7$ ) = 420 V<sub>AC</sub>; peak to peak voltage  $V_{p-p}$  ( $2 \times U_{OPAC} \times \sqrt{2}$ ) = 1188 V; maximum temporary RMS over voltage ( $< 24\text{ h}$ ) ( $0.875 \times U_{RAC}$ ) = 525 V<sub>AC</sub>
- (3) ( $U_{OPAC}$  ( $U_{RAC} \times 0.5$ ) = 300 V<sub>AC</sub>; Peak to peak voltage  $V_{p-p}$  ( $2 \times U_{OPAC} \times \sqrt{2}$ ) = 849 V; maximum temporary RMS over voltage ( $< 24\text{ h}$ ) ( $0.625 \times U_{RAC}$ ) = 375 V<sub>AC</sub>

**COMPOSITION OF CATALOG NUMBER**

**Notes**

- For detailed tape specifications refer to packaging information [www.vishay.com/doc?28139](http://www.vishay.com/doc?28139)
- (1) Capacitors with short leads up to 5 mm and pitch > 15 mm will be in tray and asking code will be "T"

**DIMENSIONS in millimeters**

**Note**

- (1)  $|F-F'| < 0.3$  mm  
 $F = 7.5$  mm + 0.6 mm / - 0.1 mm  
 $\varnothing d_t = 0.80$  mm  $\pm 10$  % for  $P < 37.5$  mm and  $\varnothing d_t = 0.95$  mm  $\pm 10$  % for  $P \geq 37.5$  mm

| ELECTRICAL DATA AND ORDERING CODE |                                                                     |                                |            |            |                              |                          |                                        |           |                            |               |                                             |                 |                                             |
|-----------------------------------|---------------------------------------------------------------------|--------------------------------|------------|------------|------------------------------|--------------------------|----------------------------------------|-----------|----------------------------|---------------|---------------------------------------------|-----------------|---------------------------------------------|
| U <sub>RDC</sub><br>(V)           | CAP.<br>(μF)                                                        | DIMENSION<br>w x h x l<br>(mm) | P1<br>(mm) | P2<br>(mm) | du/dt<br>(V/μs) <sub>R</sub> | I <sub>PEAK</sub><br>(A) | I <sub>RMS</sub> <sup>(1)</sup><br>(A) |           | ESR <sup>(2)</sup><br>(mΩ) |               | tan δ <sup>(3)</sup><br>(10 <sup>-4</sup> ) |                 | ORDERING CODE <sup>(4)</sup><br>MKP385e.... |
|                                   |                                                                     |                                |            |            |                              |                          | 2<br>PINS                              | 4<br>PINS | 2<br>PINS                  | 4<br>PINS     | 2<br>PINS                                   | 4<br>PINS       |                                             |
| 400                               | U <sub>RAC</sub> = 200 V, U <sub>p-p</sub> = 560 V, C-TOL. = ± 10 % |                                |            |            |                              |                          |                                        |           |                            |               |                                             |                 |                                             |
|                                   | 0.047                                                               | 7.0 x 13.5 x 17.5              | 15         | -          | 130                          | 5.4                      | 2.0                                    | -         | 51                         | -             | 30                                          | -               | 34740KF[1]2[2]0                             |
|                                   | 0.056                                                               |                                |            |            |                              | 6.4                      | 2.2                                    | -         | 44                         | -             | 30                                          | -               | 35640KF[1]2[2]0                             |
|                                   | 0.068                                                               |                                |            |            |                              | 7.8                      | 2.2                                    | -         | 43                         | -             | 35                                          | -               | 36840KF[1]2[2]0                             |
|                                   | 0.082                                                               |                                |            |            |                              | 9.4                      | 2.4                                    | -         | 35                         | -             | 35                                          | -               | 38240KF[1]2[2]0                             |
|                                   | 0.10                                                                |                                |            |            |                              | 11.5                     | 2.5                                    | -         | 32                         | -             | 40                                          | -               | 41040KF[1]2[2]0                             |
|                                   | 0.12                                                                |                                |            |            |                              | 13.8                     | 2.6                                    | -         | 31                         | -             | 45                                          | -               | 41240KF[1]2[2]0                             |
|                                   | 0.15                                                                | 8.5 x 15.0 x 17.5              |            |            |                              | 17.3                     | 3.1                                    | -         | 25                         | -             | 45                                          | -               | 41540KF[1]2[2]0                             |
|                                   | 0.18                                                                |                                |            |            |                              | 20.7                     | 3.1                                    | -         | 25                         | -             | 50                                          | -               | 41840KF[1]2[2]0                             |
|                                   | 0.22                                                                |                                |            |            |                              | 25.3                     | 3.4                                    | -         | 22                         | -             | 65                                          | -               | 42240KF[1]2[2]0                             |
|                                   | 0.27                                                                | 10.0 x 16.5 x 17.5             |            |            |                              | 31.1                     | 4.0                                    | -         | 18                         | -             | 70                                          | -               | 42740KF[1]2[2]0                             |
|                                   | 0.33                                                                |                                |            |            |                              | 38.0                     | 3.9                                    | -         | 18                         | -             | 70                                          | -               | 43340KF[1]2[2]0                             |
|                                   | 0.39                                                                |                                |            |            |                              | 44.9                     | 4.3                                    | -         | 16                         | -             | 75                                          | -               | 43940KF[1]2[2]0                             |
|                                   | 0.47                                                                | 11.0 x 18.5 x 18.0             |            |            |                              | 54.1                     | 4.8                                    | -         | 15                         | -             | 75                                          | -               | 44740KF[1]2[2]0                             |
|                                   | 0.22                                                                | 7.0 x 16.5 x 26.0              | 22.5       | -          | 115                          | 28.6                     | 3.0                                    | -         | 37                         | -             | 70                                          | -               | 42240KI[1]2[2]0                             |
|                                   | 0.27                                                                |                                |            |            |                              | 35.1                     | 3.1                                    | -         | 34                         | -             | 70                                          | -               | 42740KI[1]2[2]0                             |
|                                   | 0.33                                                                | 42.9                           |            |            |                              | 3.7                      | -                                      | 28        | -                          | 70            | -                                           | 43340KI[1]2[2]0 |                                             |
|                                   | 0.39                                                                | 50.7                           |            |            |                              | 3.8                      | -                                      | 26        | -                          | 75            | -                                           | 43940KI[1]2[2]0 |                                             |
|                                   | 0.47                                                                | 61.1                           |            |            |                              | 4.3                      | -                                      | 24        | -                          | 75            | -                                           | 44740KI[1]2[2]0 |                                             |
|                                   | 0.56                                                                | 72.8                           |            |            |                              | 4.7                      | -                                      | 20        | -                          | 95            | -                                           | 45640KI[1]2[2]0 |                                             |
|                                   | 0.68                                                                | 12.0 x 22.0 x 26.0             |            |            |                              | 88.4                     | 5.3                                    | -         | 18                         | -             | 100                                         | -               | 46840KI[1]2[2]0                             |
|                                   | 0.82                                                                |                                |            |            |                              | 106.6                    | 5.8                                    | -         | 15                         | -             | 105                                         | -               | 48240KI[1]2[2]0                             |
|                                   | 1.00                                                                |                                |            |            |                              | 130.0                    | 6.1                                    | -         | 14                         | -             | 110                                         | -               | 51040KI[1]2[2]0                             |
|                                   | 1.20                                                                |                                |            |            |                              | 156.0                    | 6.8                                    | -         | 12                         | -             | 110                                         | -               | 51240KI[1]2[2]0                             |
|                                   | 0.47                                                                | 9.0 x 19.0 x 31.0              | 27.5       | -          | 80                           | 37.6                     | 4.0                                    | -         | 28                         | -             | 95                                          | -               | 44740KK[1]2[2]0                             |
|                                   | 0.56                                                                |                                |            |            |                              | 44.8                     | 4.3                                    | -         | 24                         | -             | 100                                         | -               | 45640KK[1]2[2]0                             |
|                                   | 0.68                                                                | 54.4                           |            |            |                              | 4.9                      | -                                      | 21        | -                          | 100           | -                                           | 46840KK[1]2[2]0 |                                             |
|                                   | 0.82                                                                | 65.6                           |            |            |                              | 5.4                      | -                                      | 18        | -                          | 105           | -                                           | 48240KK[1]2[2]0 |                                             |
|                                   | 1.0                                                                 | 80.0                           |            |            |                              | 5.7                      | -                                      | 16        | -                          | 110           | -                                           | 51040KK[1]2[2]0 |                                             |
|                                   | 1.2                                                                 | 96.0                           |            |            |                              | 6.3                      | -                                      | 15        | -                          | 110           | -                                           | 51240KK[1]2[2]0 |                                             |
|                                   | 1.5                                                                 | 120.0                          |            |            |                              | 6.7                      | -                                      | 13        | -                          | 110           | -                                           | 51540KK[1]2[2]0 |                                             |
|                                   | 1.8                                                                 | 144.0                          |            |            |                              | 7.8                      | -                                      | 11        | -                          | 120           | -                                           | 51840KK[1]2[2]0 |                                             |
|                                   | 2.2                                                                 | 18.0 x 28.0 x 31.0             |            |            |                              | 176.0                    | 9.0                                    | -         | 10                         | -             | 125                                         | -               | 52240KK[1]2[2]0                             |
|                                   | 2.7                                                                 |                                |            |            |                              | 216.0                    | 9.8                                    | -         | 8                          | -             | 140                                         | -               | 52740KK[1]2[2]0                             |
|                                   | 3.3                                                                 | 21.0 x 31.0 x 31.0             |            |            |                              | 264.0                    | 11.6                                   | -         | 7                          | -             | 150                                         | -               | 53340KK[1]2[2]0                             |
|                                   | 3.9                                                                 |                                |            |            |                              | 312.0                    | 12.2                                   | -         | 6                          | -             | 160                                         | -               | 53940KK[1]2[2]0                             |
|                                   | 3.3                                                                 | 15.7 x 28.5 x 41.5             | 37.5       | -          | 45                           | 148.5                    | 10.7                                   | -         | 7                          | -             | 190                                         | -               | 53340KP[1]2T0                               |
|                                   | 3.9                                                                 |                                |            |            |                              | 175.5                    | 11.2                                   | -         | 7                          | -             | 200                                         | -               | 53940KP[1]2T0                               |
|                                   | 4.7                                                                 | 211.5                          |            |            |                              | 12.7                     | -                                      | 6         | -                          | 225           | -                                           | 54740KP[1]2T0   |                                             |
|                                   | 5.6                                                                 | 252.0                          |            |            |                              | 13.2                     | -                                      | 6         | -                          | 245           | -                                           | 55640KP[1]2T0   |                                             |
|                                   | 6.8                                                                 | 306.0                          |            |            |                              | 15.3                     | 16.0                                   | 5         | 5                          | 285           | 260                                         | 56840KP[1]4T0   |                                             |
|                                   | 8.2                                                                 | 369.0                          |            | 15.6       |                              | 16.4                     | 5                                      | 5         | 325                        | 295           | 58240KP[1]4T0                               |                 |                                             |
|                                   | 10                                                                  | 450.0                          |            | 16.9       |                              | 17.7                     | 5                                      | 5         | 390                        | 355           | 61040KP[1]4T0                               |                 |                                             |
|                                   | 12                                                                  | 540.0                          |            | 18.1       |                              | 19.0                     | 5                                      | 5         | 465                        | 420           | 61240KP[1]5T0                               |                 |                                             |
| 15                                | 675.0                                                               | 17.9                           |            | 18.8       |                              | 5                        | 5                                      | 595       | 540                        | 61540KP[1]5T0 |                                             |                 |                                             |

**Notes**

- <sup>(1)</sup> I<sub>RMS</sub> at 85 °C ambient temperature and 100 kHz
- <sup>(2)</sup> ESR at 85 °C and 100 kHz
- <sup>(3)</sup> Maximum tan δ value at 100 kHz
- <sup>(4)</sup> Please replace "[1]" by the lead length code and the "[2]" by the packaging type in accordance with section "Composition of Catalog Number"



| ELECTRICAL DATA AND ORDERING CODE |                                                                     |                                |            |            |                              |                          |                                        |           |                            |           |                                             |               |                                             |               |   |                 |
|-----------------------------------|---------------------------------------------------------------------|--------------------------------|------------|------------|------------------------------|--------------------------|----------------------------------------|-----------|----------------------------|-----------|---------------------------------------------|---------------|---------------------------------------------|---------------|---|-----------------|
| U <sub>RDC</sub><br>(V)           | CAP.<br>(μF)                                                        | DIMENSION<br>w x h x l<br>(mm) | P1<br>(mm) | P2<br>(mm) | du/dt<br>(V/μs) <sub>R</sub> | I <sub>PEAK</sub><br>(A) | I <sub>RMS</sub> <sup>(1)</sup><br>(A) |           | ESR <sup>(2)</sup><br>(mΩ) |           | tan δ <sup>(3)</sup><br>(10 <sup>-4</sup> ) |               | ORDERING CODE <sup>(4)</sup><br>MKP385e.... |               |   |                 |
|                                   |                                                                     |                                |            |            |                              |                          | 2<br>PINS                              | 4<br>PINS | 2<br>PINS                  | 4<br>PINS | 2<br>PINS                                   | 4<br>PINS     |                                             |               |   |                 |
| 630                               | U <sub>RAC</sub> = 220 V, U <sub>p-p</sub> = 620 V, C-TOL. = ± 10 % |                                |            |            |                              |                          |                                        |           |                            |           |                                             |               |                                             |               |   |                 |
|                                   | 0.027                                                               | 7.0 x 13.5 x 17.5              | 15         | -          | 150                          | 3.5                      | 1.4                                    | -         | 106                        | -         | 30                                          | -             | 32763KF[1]2[2]0                             |               |   |                 |
|                                   | 0.033                                                               |                                |            |            |                              | 4.3                      | 1.5                                    | -         | 87                         | -         | 30                                          | -             | 33363KF[1]2[2]0                             |               |   |                 |
|                                   | 0.039                                                               |                                |            |            |                              | 5.1                      | 1.7                                    | -         | 74                         | -         | 30                                          | -             | 33963KF[1]2[2]0                             |               |   |                 |
|                                   | 0.047                                                               |                                |            |            |                              | 6.1                      | 1.8                                    | -         | 62                         | -         | 30                                          | -             | 34763KF[1]2[2]0                             |               |   |                 |
|                                   | 0.056                                                               |                                |            |            |                              | 7.3                      | 1.8                                    | -         | 62                         | -         | 35                                          | -             | 35663KF[1]2[2]0                             |               |   |                 |
|                                   | 0.068                                                               |                                |            |            |                              | 8.8                      | 2.0                                    | -         | 51                         | -         | 35                                          | -             | 36863KF[1]2[2]0                             |               |   |                 |
|                                   | 0.082                                                               | 8.5 x 15.0 x 17.5              |            |            |                              | 10.7                     | 2.4                                    | -         | 43                         | -         | 40                                          | -             | 38263KF[1]2[2]0                             |               |   |                 |
|                                   | 0.10                                                                |                                |            |            |                              | 13.0                     | 2.6                                    | -         | 35                         | -         | 40                                          | -             | 41063KF[1]2[2]0                             |               |   |                 |
|                                   | 0.12                                                                |                                |            |            |                              | 15.6                     | 2.9                                    | -         | 30                         | -         | 45                                          | -             | 41263KF[1]2[2]0                             |               |   |                 |
|                                   | 0.15                                                                | 10.0 x 16.5 x 17.5             |            |            |                              | 19.5                     | 3.4                                    | -         | 24                         | -         | 45                                          | -             | 41563KF[1]2[2]0                             |               |   |                 |
|                                   | 0.18                                                                |                                |            |            |                              | 23.4                     | 3.7                                    | -         | 20                         | -         | 50                                          | -             | 41863KF[1]2[2]0                             |               |   |                 |
|                                   | 0.22                                                                | 10.5 x 17.5 x 18.0             |            |            |                              | 28.6                     | 4.3                                    | -         | 17                         | -         | 60                                          | -             | 42263KF[1]2[2]0                             |               |   |                 |
|                                   | 0.27                                                                | 11.0 x 18.5 x 18.0             |            |            |                              | 35.1                     | 4.9                                    | -         | 14                         | -         | 65                                          | -             | 42763KF[1]2[2]0                             |               |   |                 |
|                                   | 0.12                                                                | 7.0 x 16.5 x 26.0              | 22.5       | -          | 130                          | 18.0                     | 2.6                                    | -         | 48                         | -         | 40                                          | -             | 41263KI[1]2[2]0                             |               |   |                 |
|                                   | 0.15                                                                |                                |            |            |                              | 22.5                     | 2.9                                    | -         | 39                         | -         | 45                                          | -             | 41563KI[1]2[2]0                             |               |   |                 |
|                                   | 0.18                                                                | 8.5 x 18.0 x 26.0              |            |            |                              | 27.0                     | 3.4                                    | -         | 32                         | -         | 45                                          | -             | 41863KI[1]2[2]0                             |               |   |                 |
|                                   | 0.22                                                                |                                |            |            |                              | 33.0                     | 3.8                                    | -         | 27                         | -         | 65                                          | -             | 42263KI[1]2[2]0                             |               |   |                 |
|                                   | 0.27                                                                |                                |            |            |                              | 40.5                     | 4.5                                    | -         | 22                         | -         | 70                                          | -             | 42763KI[1]2[2]0                             |               |   |                 |
|                                   | 0.33                                                                | 10.0 x 19.5 x 26.0             |            |            |                              | 49.5                     | 4.9                                    | -         | 18                         | -         | 70                                          | -             | 43363KI[1]2[2]0                             |               |   |                 |
|                                   | 0.39                                                                | 12.0 x 22.0 x 26.0             |            |            |                              | 58.5                     | 5.8                                    | -         | 15                         | -         | 75                                          | -             | 43963KI[1]2[2]0                             |               |   |                 |
|                                   | 0.47                                                                |                                |            |            |                              | 70.5                     | 6.3                                    | -         | 13                         | -         | 75                                          | -             | 44763KI[1]2[2]0                             |               |   |                 |
|                                   | 0.56                                                                |                                |            |            |                              | 84.0                     | 6.9                                    | -         | 11                         | -         | 80                                          | -             | 45663KI[1]2[2]0                             |               |   |                 |
|                                   | 0.27                                                                | 9.0 x 19.0 x 31.0              |            |            |                              | 27.5                     | -                                      | 90        | 24.3                       | 3.6       | -                                           | 34            | -                                           | 70            | - | 42763KK[1]2[2]0 |
|                                   | 0.33                                                                |                                |            |            |                              |                          |                                        |           | 29.7                       | 3.9       | -                                           | 28            | -                                           | 70            | - | 43363KK[1]2[2]0 |
|                                   | 0.39                                                                | 11.0 x 21.0 x 31.0             |            |            |                              |                          |                                        |           | 35.1                       | 4.6       | -                                           | 24            | -                                           | 75            | - | 43963KK[1]2[2]0 |
|                                   | 0.47                                                                |                                |            |            |                              |                          |                                        |           | 42.3                       | 5.1       | -                                           | 20            | -                                           | 75            | - | 44763KK[1]2[2]0 |
|                                   | 0.56                                                                |                                | 50.4       | 5.5        | -                            |                          |                                        |           | 17                         | -         | 80                                          | -             | 45663KK[1]2[2]0                             |               |   |                 |
|                                   | 0.68                                                                | 13.0 x 23.0 x 31.0             | 61.2       | 6.5        | -                            |                          |                                        |           | 14                         | -         | 85                                          | -             | 46863KK[1]2[2]0                             |               |   |                 |
|                                   | 0.82                                                                |                                | 73.8       | 7.1        | -                            |                          |                                        |           | 12                         | -         | 90                                          | -             | 48263KK[1]2[2]0                             |               |   |                 |
|                                   | 1.0                                                                 | 15.0 x 25.0 x 31.0             | 90.0       | 8.3        | -                            |                          |                                        |           | 10                         | -         | 95                                          | -             | 51063KK[1]2[2]0                             |               |   |                 |
|                                   | 1.2                                                                 | 18.0 x 28.0 x 31.0             | 108.0      | 9.9        | -                            |                          |                                        |           | 8                          | -         | 100                                         | -             | 51263KK[1]2[2]0                             |               |   |                 |
|                                   | 1.5                                                                 |                                | 135.0      | 10.9       | -                            |                          |                                        |           | 7                          | -         | 105                                         | -             | 51563KK[1]2[2]0                             |               |   |                 |
|                                   | 1.8                                                                 | 21.0 x 31.0 x 31.0             | 162.0      | 12.8       | -                            |                          |                                        |           | 6                          | -         | 110                                         | -             | 51863KK[1]2[2]0                             |               |   |                 |
|                                   | 2.2                                                                 |                                | 198.0      | 14.0       | -                            |                          |                                        |           | 5                          | -         | 120                                         | -             | 52263KK[1]2[2]0                             |               |   |                 |
|                                   | 2.7                                                                 | 18 x 32.5 x 41.5               | 37.5       | -          | 50                           |                          |                                        |           | 135.0                      | 11.7      | -                                           | 7             | -                                           | 150           | - | 52763KP[1]2T0   |
|                                   | 3.3                                                                 | 18.5 x 35.5 x 43               |            | 10.2       |                              | 165.0                    | 12.1                                   | 12.7      | 7                          | 7         | 190                                         | 175           | 53363KP[1]4T0                               |               |   |                 |
|                                   | 3.9                                                                 | 21.5 x 38.5 x 42               |            |            |                              | 195.0                    | 12.9                                   | 13.6      | 7                          | 7         | 225                                         | 205           | 53963KP[1]4T0                               |               |   |                 |
|                                   | 4.7                                                                 |                                |            |            |                              | 235.0                    | 13.0                                   | 13.7      | 7                          | 7         | 270                                         | 245           | 54763KP[1]4T0                               |               |   |                 |
|                                   | 5.6                                                                 | 24 x 44 x 42                   |            |            |                              | 280.0                    | 14.3                                   | 15.0      | 7                          | 7         | 305                                         | 275           | 55663KP[1]4T0                               |               |   |                 |
|                                   | 6.8                                                                 | 30 x 45 x 42                   |            | 340.0      |                              | 16.0                     | 16.7                                   | 6         | 6                          | 340       | 310                                         | 56863KP[1]5T0 |                                             |               |   |                 |
|                                   | 8.2                                                                 |                                |            | 410.0      |                              | 17.0                     | 17.8                                   | 6         | 6                          | 365       | 330                                         | 58263KP[1]5T0 |                                             |               |   |                 |
| 15                                | 35 x 50 x 57.5                                                      | 52.5                           |            |            |                              | 25                       | 375.0                                  | 17.6      | 18.4                       | 7         | 7                                           | 840           | 760                                         | 61563KY[1]5T0 |   |                 |

## Notes

- (1) I<sub>RMS</sub> at 85 °C ambient temperature and 100 kHz  
 (2) ESR at 85 °C and 100 kHz  
 (3) Maximum tan δ value at 100 kHz  
 (4) Please replace "[1]" by the lead length code and the "[2]" by the packaging type in accordance with section "Composition of Catalog Number"

| ELECTRICAL DATA AND ORDERING CODE |                                                                     |                                |            |            |                              |                          |                                        |           |                            |           |                                             |               |                                             |  |  |  |  |
|-----------------------------------|---------------------------------------------------------------------|--------------------------------|------------|------------|------------------------------|--------------------------|----------------------------------------|-----------|----------------------------|-----------|---------------------------------------------|---------------|---------------------------------------------|--|--|--|--|
| U <sub>RDC</sub><br>(V)           | CAP.<br>(μF)                                                        | DIMENSION<br>w x h x l<br>(mm) | P1<br>(mm) | P2<br>(mm) | du/dt<br>(V/μs) <sub>R</sub> | I <sub>PEAK</sub><br>(A) | I <sub>RMS</sub> <sup>(1)</sup><br>(A) |           | ESR <sup>(2)</sup><br>(mΩ) |           | tan δ <sup>(3)</sup><br>(10 <sup>-4</sup> ) |               | ORDERING CODE <sup>(4)</sup><br>MKP385e.... |  |  |  |  |
|                                   |                                                                     |                                |            |            |                              |                          | 2<br>PINS                              | 4<br>PINS | 2<br>PINS                  | 4<br>PINS | 2<br>PINS                                   | 4<br>PINS     |                                             |  |  |  |  |
| 850                               | U <sub>RAC</sub> = 300 V, U <sub>p-p</sub> = 850 V, C-TOL. = ± 10 % |                                |            |            |                              |                          |                                        |           |                            |           |                                             |               |                                             |  |  |  |  |
|                                   | 0.010                                                               | 7.0 x 13.5 x 17.5              | 15         | -          | 590                          | 5.9                      | 1.2                                    | -         | 154                        | -         | 25                                          | -             | 31085KF[1]2[2]0                             |  |  |  |  |
|                                   | 0.012                                                               |                                |            |            |                              | 7.1                      | 1.2                                    | -         | 147                        | -         | 25                                          | -             | 31285KF[1]2[2]0                             |  |  |  |  |
|                                   | 0.015                                                               |                                |            |            |                              | 8.9                      | 1.3                                    | -         | 118                        | -         | 25                                          | -             | 31585KF[1]2[2]0                             |  |  |  |  |
|                                   | 0.018                                                               |                                |            |            |                              | 10.6                     | 1.4                                    | -         | 107                        | -         | 25                                          | -             | 31885KF[1]2[2]0                             |  |  |  |  |
|                                   | 0.022                                                               |                                |            |            |                              | 13.0                     | 1.5                                    | -         | 88                         | -         | 25                                          | -             | 32285KF[1]2[2]0                             |  |  |  |  |
|                                   | 0.027                                                               |                                |            |            |                              | 15.9                     | 1.6                                    | -         | 79                         | -         | 30                                          | -             | 32785KF[1]2[2]0                             |  |  |  |  |
|                                   | 0.033                                                               |                                |            |            |                              | 19.5                     | 1.7                                    | -         | 74                         | -         | 30                                          | -             | 33385KF[1]2[2]0                             |  |  |  |  |
|                                   | 0.039                                                               |                                |            |            |                              | 23.0                     | 1.8                                    | -         | 63                         | -         | 30                                          | -             | 33985KF[1]2[2]0                             |  |  |  |  |
|                                   | 0.047                                                               | 8.5 x 15.0 x 17.5              |            |            |                              | 27.7                     | 2.0                                    | -         | 59                         | -         | 35                                          | -             | 34785KF[1]2[2]0                             |  |  |  |  |
|                                   | 0.056                                                               |                                |            |            |                              | 33.0                     | 2.2                                    | -         | 50                         | -         | 35                                          | -             | 35685KF[1]2[2]0                             |  |  |  |  |
|                                   | 0.068                                                               |                                |            |            |                              | 40.1                     | 2.4                                    | -         | 41                         | -         | 35                                          | -             | 36885KF[1]2[2]0                             |  |  |  |  |
|                                   | 0.082                                                               | 10.0 x 16.5 x 17.5             |            |            |                              | 48.4                     | 2.9                                    | -         | 34                         | -         | 40                                          | -             | 38285KF[1]2[2]0                             |  |  |  |  |
|                                   | 0.10                                                                |                                |            |            |                              | 59.0                     | 3.2                                    | -         | 28                         | -         | 40                                          | -             | 41085KF[1]2[2]0                             |  |  |  |  |
|                                   | 0.12                                                                | 10.5 x 17.5 x 18.0             |            |            |                              | 70.8                     | 3.6                                    | -         | 24                         | -         | 40                                          | -             | 41285KF[1]2[2]0                             |  |  |  |  |
|                                   | 0.033                                                               | 7.0 x 16.5 x 26.0              | 22.5       | -          | 530                          | 17.5                     | 1.8                                    | -         | 103                        | -         | 30                                          | -             | 33385KI[1]2[2]0                             |  |  |  |  |
|                                   | 0.039                                                               |                                |            |            |                              | 20.7                     | 1.8                                    | -         | 98                         | -         | 30                                          | -             | 33985KI[1]2[2]0                             |  |  |  |  |
|                                   | 0.047                                                               | 8.5 x 18.0 x 26.0              |            |            |                              | 24.9                     | 2.0                                    | -         | 82                         | -         | 30                                          | -             | 34785KI[1]2[2]0                             |  |  |  |  |
|                                   | 0.056                                                               |                                |            |            |                              | 29.7                     | 2.2                                    | -         | 79                         | -         | 35                                          | -             | 35685KI[1]2[2]0                             |  |  |  |  |
|                                   | 0.068                                                               |                                |            |            |                              | 36.0                     | 2.4                                    | -         | 65                         | -         | 35                                          | -             | 36885KI[1]2[2]0                             |  |  |  |  |
|                                   | 0.082                                                               |                                |            |            |                              | 43.5                     | 2.4                                    | -         | 63                         | -         | 40                                          | -             | 38285KI[1]2[2]0                             |  |  |  |  |
|                                   | 0.10                                                                |                                |            |            |                              | 53.0                     | 2.4                                    | -         | 64                         | -         | 45                                          | -             | 41085KI[1]2[2]0                             |  |  |  |  |
|                                   | 0.12                                                                |                                |            |            |                              | 63.6                     | 2.7                                    | -         | 53                         | -         | 45                                          | -             | 41285KI[1]2[2]0                             |  |  |  |  |
|                                   | 0.15                                                                | 10.0 x 19.5 x 26.0             |            |            |                              | 79.5                     | 3.2                                    | -         | 43                         | -         | 50                                          | -             | 41585KI[1]2[2]0                             |  |  |  |  |
|                                   | 0.18                                                                |                                |            |            |                              | 95.4                     | 3.5                                    | -         | 36                         | -         | 55                                          | -             | 41885KI[1]2[2]0                             |  |  |  |  |
|                                   | 0.22                                                                | 12.0 x 22.0 x 26.0             |            |            |                              | 116.6                    | 4.2                                    | -         | 30                         | -         | 60                                          | -             | 42285KI[1]2[2]0                             |  |  |  |  |
|                                   | 0.27                                                                |                                |            |            |                              | 143.1                    | 4.6                                    | -         | 24                         | -         | 65                                          | -             | 42785KI[1]2[2]0                             |  |  |  |  |
|                                   | 0.33                                                                | 9.0 x 19.0 x 31.0              | 27.5       | -          | 330                          | 174.9                    | 5.1                                    | -         | 20                         | -         | 70                                          | -             | 43385KI[1]2[2]0                             |  |  |  |  |
|                                   | 0.10                                                                |                                |            |            |                              | 33.0                     | 2.6                                    | -         | 67                         | -         | 40                                          | -             | 41085KK[1]2[2]0                             |  |  |  |  |
|                                   | 0.12                                                                |                                |            |            |                              | 39.6                     | 3.0                                    | -         | 55                         | -         | 40                                          | -             | 41285KK[1]2[2]0                             |  |  |  |  |
|                                   | 0.15                                                                |                                |            |            |                              | 49.5                     | 3.4                                    | -         | 44                         | -         | 45                                          | -             | 41585KK[1]2[2]0                             |  |  |  |  |
|                                   | 0.18                                                                |                                |            |            |                              | 59.4                     | 3.5                                    | -         | 43                         | -         | 50                                          | -             | 41885KK[1]2[2]0                             |  |  |  |  |
|                                   | 0.22                                                                |                                |            |            |                              | 72.6                     | 3.5                                    | -         | 41                         | -         | 60                                          | -             | 42285KK[1]2[2]0                             |  |  |  |  |
|                                   | 0.27                                                                |                                |            |            |                              | 89.1                     | 3.9                                    | -         | 34                         | -         | 65                                          | -             | 42785KK[1]2[2]0                             |  |  |  |  |
|                                   | 0.33                                                                |                                |            |            |                              | 108.9                    | 3.8                                    | -         | 36                         | -         | 75                                          | -             | 43385KK[1]2[2]0                             |  |  |  |  |
|                                   | 0.39                                                                | 13.0 x 23.0 x 31.0             |            |            |                              | 128.7                    | 4.4                                    | -         | 31                         | -         | 75                                          | -             | 43985KK[1]2[2]0                             |  |  |  |  |
|                                   | 0.47                                                                |                                |            |            |                              | 155.1                    | 4.8                                    | -         | 26                         | -         | 75                                          | -             | 44785KK[1]2[2]0                             |  |  |  |  |
|                                   | 0.56                                                                | 15.0 x 25.0 x 31.0             |            |            |                              | 184.8                    | 5.6                                    | -         | 22                         | -         | 85                                          | -             | 45685KK[1]2[2]0                             |  |  |  |  |
|                                   | 0.68                                                                |                                |            |            |                              | 224.4                    | 6.1                                    | -         | 19                         | -         | 95                                          | -             | 46885KK[1]2[2]0                             |  |  |  |  |
|                                   | 0.82                                                                | 18.0 x 28.0 x 31.0             |            |            |                              | 270.6                    | 7.3                                    | -         | 15                         | -         | 100                                         | -             | 48285KK[1]2[2]0                             |  |  |  |  |
|                                   | 1.0                                                                 | 21.0 x 31.0 x 31.0             |            |            |                              | 330.0                    | 8.6                                    | -         | 13                         | -         | 105                                         | -             | 51085KK[1]2[2]0                             |  |  |  |  |
|                                   | 1.2                                                                 |                                |            |            |                              | 396.0                    | 9.4                                    | -         | 11                         | -         | 110                                         | -             | 51285KK[1]2[2]0                             |  |  |  |  |
|                                   | 1.5                                                                 | 15.7 x 28.5 x 41.5             | 37.5       | -          | 150                          | 225.0                    | 11.4                                   | -         | 6                          | -         | 75                                          | -             | 51585KP[1]2T0                               |  |  |  |  |
|                                   | 1.7                                                                 | 18 x 32.5 x 41.5               |            |            |                              | 255.0                    | 12.5                                   | -         | 6                          | -         | 85                                          | -             | 51785KP[1]2T0                               |  |  |  |  |
|                                   | 1.8                                                                 |                                |            |            |                              | 270.0                    | 12.6                                   | -         | 6                          | -         | 90                                          | -             | 51885KP[1]2T0                               |  |  |  |  |
|                                   | 2.2                                                                 | 18.5 x 35.5 x 43               |            |            |                              | 330.0                    | 13.5                                   | 14.2      | 6                          | 6         | 105                                         | 95            | 52285KP[1]4T0                               |  |  |  |  |
|                                   | 2.7                                                                 | 21.5 x 38.5 x 42               |            | 10.2       |                              | 405.0                    | 14.8                                   | 15.5      | 6                          | 6         | 120                                         | 110           | 52785KP[1]4T0                               |  |  |  |  |
|                                   | 3.3                                                                 | 24 x 44 x 42                   |            |            |                              | 495.0                    | 16.1                                   | 17.0      | 5                          | 5         | 140                                         | 130           | 53385KP[1]4T0                               |  |  |  |  |
|                                   | 3.9                                                                 |                                |            |            |                              | 585.0                    | 16.5                                   | 17.3      | 5                          | 5         | 160                                         | 145           | 53985KP[1]4T0                               |  |  |  |  |
| 4.7                               | 30 x 45 x 42                                                        | 20.3                           |            | 705.0      |                              | 18.1                     | 19.0                                   | 5         | 5                          | 185       | 170                                         | 54785KP[1]5T0 |                                             |  |  |  |  |

**Notes**
<sup>(1)</sup> I<sub>RMS</sub> at 85 °C ambient temperature and 100 kHz

<sup>(2)</sup> ESR at 85 °C and 100 kHz

<sup>(3)</sup> Maximum tan δ value at 100 kHz

<sup>(4)</sup> Please replace "[1]" by the lead length code and the "[2]" by the packaging type in accordance with section "Composition of Catalog Number"

| ELECTRICAL DATA AND ORDERING CODE |                                                                      |                                |            |            |                              |                          |                                        |           |                            |           |                                             |               |                                             |
|-----------------------------------|----------------------------------------------------------------------|--------------------------------|------------|------------|------------------------------|--------------------------|----------------------------------------|-----------|----------------------------|-----------|---------------------------------------------|---------------|---------------------------------------------|
| U <sub>RDC</sub><br>(V)           | CAP.<br>(μF)                                                         | DIMENSION<br>w x h x l<br>(mm) | P1<br>(mm) | P2<br>(mm) | du/dt<br>(V/μs) <sub>R</sub> | I <sub>PEAK</sub><br>(A) | I <sub>RMS</sub> <sup>(1)</sup><br>(A) |           | ESR <sup>(2)</sup><br>(mΩ) |           | tan δ <sup>(3)</sup><br>(10 <sup>-4</sup> ) |               | ORDERING CODE <sup>(4)</sup><br>MKP385e.... |
|                                   |                                                                      |                                |            |            |                              |                          | 2<br>PINS                              | 4<br>PINS | 2<br>PINS                  | 4<br>PINS | 2<br>PINS                                   | 4<br>PINS     |                                             |
| 1000                              | U <sub>RAC</sub> = 350 V, U <sub>p-p</sub> = 1000 V, C-TOL. = ± 10 % |                                |            |            |                              |                          |                                        |           |                            |           |                                             |               |                                             |
|                                   | 0.018                                                                | 7.0 x 13.5 x 17.5              | 15         | -          | 590                          | 10.6                     | 1.8                                    | -         | 66                         | -         | 20                                          | -             | 31810KF[1]2[2]0                             |
|                                   | 0.022                                                                |                                |            |            |                              | 13.0                     | 1.9                                    | -         | 59                         | -         | 20                                          | -             | 32210KF[1]2[2]0                             |
|                                   | 0.027                                                                |                                |            |            |                              | 15.9                     | 1.9                                    | -         | 54                         | -         | 25                                          | -             | 32710KF[1]2[2]0                             |
|                                   | 0.033                                                                | 8.5 x 15.0 x 17.5              |            |            |                              | 19.5                     | 2.3                                    | -         | 47                         | -         | 25                                          | -             | 33310KF[1]2[2]0                             |
|                                   | 0.039                                                                |                                |            |            |                              | 23.0                     | 2.3                                    | -         | 45                         | -         | 30                                          | -             | 33910KF[1]2[2]0                             |
|                                   | 0.047                                                                |                                |            |            |                              | 27.7                     | 2.3                                    | -         | 44                         | -         | 30                                          | -             | 34710KF[1]2[2]0                             |
|                                   | 0.056                                                                | 10.0 x 16.5 x 17.5             |            |            |                              | 33.0                     | 2.8                                    | -         | 37                         | -         | 35                                          | -             | 35610KF[1]2[2]0                             |
|                                   | 0.068                                                                |                                |            |            |                              | 40.1                     | 2.8                                    | -         | 35                         | -         | 40                                          | -             | 36810KF[1]2[2]0                             |
|                                   | 0.082                                                                |                                |            |            |                              | 48.4                     | 3.3                                    | -         | 29                         | -         | 45                                          | -             | 38210KF[1]2[2]0                             |
|                                   | 0.056                                                                | 7.0 x 16.5 x 26.0              | 22.5       | -          | 530                          | 29.7                     | 2.1                                    | -         | 72                         | -         | 30                                          | -             | 35610KI[1]2[2]0                             |
|                                   | 0.068                                                                | 8.5 x 18.0 x 26.0              |            |            |                              | 36.0                     | 2.4                                    | -         | 64                         | -         | 35                                          | -             | 36810KI[1]2[2]0                             |
|                                   | 0.082                                                                |                                |            |            |                              | 43.5                     | 2.7                                    | -         | 53                         | -         | 40                                          | -             | 38210KI[1]2[2]0                             |
|                                   | 0.10                                                                 | 10.0 x 19.5 x 26.0             |            |            |                              | 53.0                     | 3.1                                    | -         | 44                         | -         | 40                                          | -             | 41010KI[1]2[2]0                             |
|                                   | 0.12                                                                 |                                |            |            |                              | 63.6                     | 3.4                                    | -         | 37                         | -         | 45                                          | -             | 41210KI[1]2[2]0                             |
|                                   | 0.15                                                                 | 12.0 x 22.0 x 26.0             |            |            |                              | 79.5                     | 4.2                                    | -         | 30                         | -         | 45                                          | -             | 41510KI[1]2[2]0                             |
|                                   | 0.18                                                                 |                                |            |            |                              | 95.4                     | 4.3                                    | -         | 27                         | -         | 50                                          | -             | 41810KI[1]2[2]0                             |
|                                   | 0.22                                                                 |                                |            |            |                              | 116.6                    | 4.6                                    | -         | 24                         | -         | 65                                          | -             | 42210KI[1]2[2]0                             |
|                                   | 0.10                                                                 | 9.0 x 19.0 x 31.0              | 27.5       | -          | 330                          | 33.0                     | 2.7                                    | -         | 60                         | -         | 45                                          | -             | 41010KK[1]2[2]0                             |
|                                   | 0.12                                                                 |                                |            |            |                              | 39.6                     | 2.8                                    | -         | 58                         | -         | 45                                          | -             | 41210KK[1]2[2]0                             |
|                                   | 0.15                                                                 | 11.0 x 21.0 x 31.0             |            |            |                              | 49.5                     | 3.3                                    | -         | 47                         | -         | 50                                          | -             | 41510KK[1]2[2]0                             |
|                                   | 0.18                                                                 |                                |            |            |                              | 59.4                     | 3.6                                    | -         | 39                         | -         | 50                                          | -             | 41810KK[1]2[2]0                             |
|                                   | 0.22                                                                 |                                |            |            |                              | 72.6                     | 3.8                                    | -         | 35                         | -         | 70                                          | -             | 42210KK[1]2[2]0                             |
|                                   | 0.27                                                                 | 13.0 x 23.0 x 31.0             |            |            |                              | 89.1                     | 4.5                                    | -         | 29                         | -         | 70                                          | -             | 42710KK[1]2[2]0                             |
|                                   | 0.33                                                                 |                                |            |            |                              | 108.9                    | 4.8                                    | -         | 26                         | -         | 75                                          | -             | 43310KK[1]2[2]0                             |
|                                   | 0.39                                                                 | 15.0 x 25.0 x 31.0             |            |            |                              | 128.7                    | 5.5                                    | -         | 22                         | -         | 75                                          | -             | 43910KK[1]2[2]0                             |
|                                   | 0.47                                                                 |                                |            |            |                              | 155.1                    | 5.7                                    | -         | 21                         | -         | 80                                          | -             | 44710KK[1]2[2]0                             |
|                                   | 0.56                                                                 |                                |            |            |                              | 18.0 x 28.0 x 31.0       | 184.8                                  | 6.6       | -                          | 19        | -                                           | 95            | -                                           |
|                                   | 0.68                                                                 | 21.0 x 31.0 x 31.0             |            |            |                              | 224.4                    | 7.8                                    | -         | 16                         | -         | 100                                         | -             | 46810KK[1]2[2]0                             |
|                                   | 0.82                                                                 |                                |            |            |                              | 270.6                    | 8.3                                    | -         | 14                         | -         | 105                                         | -             | 48210KK[1]2[2]0                             |
|                                   | 1.0                                                                  | 15.7 x 28.5 x 41.5             | 37.5       | -          | 180                          | 180.0                    | 10.5                                   | -         | 7                          | -         | 60                                          | -             | 51010KP[1]2T0                               |
|                                   | 1.2                                                                  | 18 x 32.5 x 41.5               |            |            |                              | 216.0                    | 11.9                                   | -         | 7                          | -         | 65                                          | -             | 51210KP[1]2T0                               |
|                                   | 1.5                                                                  | 18.5 x 35.5 x 43               |            |            |                              | 270.0                    | 13.3                                   | 14.0      | 6                          | 6         | 75                                          | 70            | 51510KP[1]4T0                               |
|                                   | 1.8                                                                  | 21.5 x 38.5 x 42               |            | 10.2       |                              | 324.0                    | 14.7                                   | 15.5      | 6                          | 6         | 80                                          | 75            | 51810KP[1]4T0                               |
|                                   | 2.2                                                                  | 24 x 44 x 42                   |            |            |                              | 396.0                    | 16.4                                   | 17.3      | 5                          | 5         | 90                                          | 85            | 52210KP[1]4T0                               |
|                                   | 2.7                                                                  |                                |            |            |                              | 486.0                    | 17.0                                   | 17.8      | 5                          | 5         | 105                                         | 95            | 52710KP[1]4T0                               |
| 3.3                               | 30 x 45 x 42                                                         | 20.3                           |            | 594.0      |                              | 18.7                     | 19.6                                   | 5         | 5                          | 120       | 110                                         | 53310KP[1]5T0 |                                             |

**Notes**
<sup>(1)</sup> I<sub>RMS</sub> at 85 °C ambient temperature and 100 kHz

<sup>(2)</sup> ESR at 85 °C and 100 kHz

<sup>(3)</sup> Maximum tan δ value at 100 kHz

<sup>(4)</sup> Please replace "[1]" by the lead length code and the "[2]" by the packaging type in accordance with section "Composition of Catalog Number"

| ELECTRICAL DATA AND ORDERING CODE |                                                                      |                                |            |            |                              |                          |                                        |           |                            |           |                                             |                 |                                             |
|-----------------------------------|----------------------------------------------------------------------|--------------------------------|------------|------------|------------------------------|--------------------------|----------------------------------------|-----------|----------------------------|-----------|---------------------------------------------|-----------------|---------------------------------------------|
| U <sub>RDC</sub><br>(V)           | CAP.<br>(μF)                                                         | DIMENSION<br>w x h x l<br>(mm) | P1<br>(mm) | P2<br>(mm) | du/dt<br>(V/μs) <sub>R</sub> | I <sub>PEAK</sub><br>(A) | I <sub>RMS</sub> <sup>(1)</sup><br>(A) |           | ESR <sup>(2)</sup><br>(mΩ) |           | tan δ <sup>(3)</sup><br>(10 <sup>-4</sup> ) |                 | ORDERING CODE <sup>(4)</sup><br>MKP385e.... |
|                                   |                                                                      |                                |            |            |                              |                          | 2<br>PINS                              | 4<br>PINS | 2<br>PINS                  | 4<br>PINS | 2<br>PINS                                   | 4<br>PINS       |                                             |
| 1250                              | U <sub>RAC</sub> = 450 V, U <sub>p-p</sub> = 1250 V, C-TOL. = ± 10 % |                                |            |            |                              |                          |                                        |           |                            |           |                                             |                 |                                             |
|                                   | 0.0082                                                               | 7.0 x 13.5 x 17.5              | 15         | -          | 670                          | 5.5                      | 1.7                                    | -         | 71                         | -         | 20                                          | -               | 28212KF[1]2[2]0                             |
|                                   | 0.010                                                                |                                |            |            |                              | 6.7                      | 1.8                                    | -         | 64                         | -         | 20                                          | -               | 31012KF[1]2[2]0                             |
|                                   | 0.012                                                                |                                |            |            |                              | 8.0                      | 1.9                                    | -         | 60                         | -         | 20                                          | -               | 31212KF[1]2[2]0                             |
|                                   | 0.015                                                                |                                |            |            |                              | 10.1                     | 2.0                                    | -         | 51                         | -         | 25                                          | -               | 31512KF[1]2[2]0                             |
|                                   | 0.018                                                                |                                |            |            |                              | 12.1                     | 2.2                                    | -         | 43                         | -         | 25                                          | -               | 31812KF[1]2[2]0                             |
|                                   | 0.022                                                                | 8.5 x 15.0 x 17.5              |            |            |                              | 14.7                     | 2.6                                    | -         | 35                         | -         | 25                                          | -               | 32212KF[1]2[2]0                             |
|                                   | 0.027                                                                |                                |            |            |                              | 18.1                     | 2.9                                    | -         | 29                         | -         | 25                                          | -               | 32712KF[1]2[2]0                             |
|                                   | 0.033                                                                |                                |            |            |                              | 22.1                     | 3.2                                    | -         | 24                         | -         | 30                                          | -               | 33312KF[1]2[2]0                             |
|                                   | 0.039                                                                |                                |            |            |                              | 26.1                     | 3.7                                    | -         | 20                         | -         | 30                                          | -               | 33912KF[1]2[2]0                             |
|                                   | 0.047                                                                |                                |            |            |                              | 31.5                     | 4.1                                    | -         | 17                         | -         | 30                                          | -               | 34712KF[1]2[2]0                             |
|                                   | 0.056                                                                | 10.5 x 17.5 x 18.0             |            |            |                              | 37.5                     | 4.7                                    | -         | 14                         | -         | 35                                          | -               | 35612KF[1]2[2]0                             |
|                                   | 0.068                                                                | 11.0 x 18.5 x 18.0             |            |            |                              | 45.6                     | 5.3                                    | -         | 12                         | -         | 35                                          | -               | 36812KF[1]2[2]0                             |
|                                   | 0.047                                                                | 8.5 x 18.0 x 26.0              | 22.5       | -          | 600                          | 28.2                     | 3.2                                    | -         | 37                         | -         | 30                                          | -               | 34712KI[1]2[2]0                             |
|                                   | 0.056                                                                |                                |            |            |                              | 33.6                     | 3.5                                    | -         | 32                         | -         | 30                                          | -               | 35612KI[1]2[2]0                             |
|                                   | 0.068                                                                |                                |            |            |                              | 40.8                     | 3.8                                    | -         | 26                         | -         | 35                                          | -               | 36812KI[1]2[2]0                             |
|                                   | 0.082                                                                |                                |            |            |                              | 49.2                     | 4.5                                    | -         | 22                         | -         | 40                                          | -               | 38212KI[1]2[2]0                             |
|                                   | 0.10                                                                 |                                |            |            |                              | 60.0                     | 4.9                                    | -         | 18                         | -         | 40                                          | -               | 41012KI[1]2[2]0                             |
|                                   | 0.12                                                                 | 12.0 x 22.0 x 26.0             |            |            |                              | 72.0                     | 5.9                                    | -         | 15                         | -         | 45                                          | -               | 41212KI[1]2[2]0                             |
|                                   | 0.15                                                                 | 90.0                           |            |            |                              | 6.5                      | -                                      | 12        | -                          | 45        | -                                           | 41512KI[1]2[2]0 |                                             |
|                                   | 0.18                                                                 | 12.5 x 22.5 x 26.5             |            |            |                              | 108.0                    | 7.3                                    | -         | 10                         | -         | 45                                          | -               | 41812KI[1]2[2]0                             |
|                                   | 0.10                                                                 | 9.0 x 19.0 x 31.0              | 27.5       | -          | 370                          | 37.0                     | 4.7                                    | -         | 20                         | -         | 45                                          | -               | 41012KK[1]2[2]0                             |
|                                   | 0.12                                                                 | 44.4                           |            |            |                              | 5.6                      | -                                      | 17        | -                          | 45        | -                                           | 41212KK[1]2[2]0 |                                             |
|                                   | 0.15                                                                 | 55.5                           |            |            |                              | 6.2                      | -                                      | 13        | -                          | 45        | -                                           | 41512KK[1]2[2]0 |                                             |
|                                   | 0.18                                                                 | 66.6                           |            |            |                              | 7.3                      | -                                      | 11        | -                          | 50        | -                                           | 41812KK[1]2[2]0 |                                             |
|                                   | 0.22                                                                 | 81.4                           |            |            |                              | 8.0                      | -                                      | 9         | -                          | 65        | -                                           | 42212KK[1]2[2]0 |                                             |
|                                   | 0.27                                                                 | 99.9                           |            |            |                              | 9.4                      | -                                      | 8         | -                          | 65        | -                                           | 42712KK[1]2[2]0 |                                             |
|                                   | 0.33                                                                 | 122.1                          |            |            |                              | 10.2                     | -                                      | 6         | -                          | 70        | -                                           | 43312KK[1]2[2]0 |                                             |
|                                   | 0.39                                                                 | 144.3                          |            |            |                              | 12.1                     | -                                      | 6         | -                          | 70        | -                                           | 43912KK[1]2[2]0 |                                             |
|                                   | 0.47                                                                 | 173.9                          |            |            |                              | 13.1                     | -                                      | 5         | -                          | 75        | -                                           | 44712KK[1]2[2]0 |                                             |
|                                   | 0.56                                                                 | 21.0 x 31.0 x 31.0             |            |            |                              | 207.2                    | 15.3                                   | -         | 4                          | -         | 80                                          | -               | 45612KK[1]2[2]0                             |
|                                   | 0.68                                                                 | 15.7 x 28.5 x 41.5             | 37.5       | -          | 200                          | 136.0                    | 15.8                                   | -         | 3                          | -         | 20                                          | -               | 46812KP[1]2T0                               |
|                                   | 0.82                                                                 | 18 x 32.5 x 41.5               |            |            |                              | 164.0                    | 14.4                                   | -         | 5                          | -         | 30                                          | -               | 48212KP[1]2T0                               |
|                                   | 1.0                                                                  |                                |            |            |                              | 200.0                    | 13.2                                   | -         | 6                          | -         | 45                                          | -               | 51012KP[1]2T0                               |
|                                   | 1.2                                                                  |                                |            |            |                              | 240.0                    | 13.3                                   | 13.9      | 6                          | 6         | 60                                          | 55              | 51212KP[1]4T0                               |
|                                   | 1.5                                                                  | 21.5 x 38.5 x 42               |            | 10.2       |                              | 300.0                    | 14.1                                   | 14.8      | 6                          | 6         | 75                                          | 70              | 51512KP[1]4T0                               |
|                                   | 1.8                                                                  | 24 x 44 x 42                   |            |            |                              | 360.0                    | 15.7                                   | 16.4      | 6                          | 6         | 85                                          | 80              | 51812KP[1]4T0                               |
|                                   | 2.2                                                                  | 30 x 45 x 42                   |            |            |                              | 440.0                    | 18.1                                   | 19.1      | 5                          | 5         | 85                                          | 80              | 52212KP[1]5T0                               |
|                                   | 2.7                                                                  |                                |            | 540.0      |                              | 18.5                     | 19.5                                   | 5         | 5                          | 100       | 90                                          | 52712KP[1]5T0   |                                             |

**Notes**
<sup>(1)</sup> I<sub>RMS</sub> at 85 °C ambient temperature and 100 kHz

<sup>(2)</sup> ESR at 85 °C and 100 kHz

<sup>(3)</sup> Maximum tan δ value at 100 kHz

<sup>(4)</sup> Please replace "[1]" by the lead length code and the "[2]" by the packaging type in accordance with section "Composition of Catalog Number"





## ELECTRICAL DATA AND ORDERING CODE

| U <sub>RDC</sub><br>(V) | CAP.<br>(μF)                                                         | DIMENSION<br>w x h x l<br>(mm) | P1<br>(mm) | P2<br>(mm) | du/dt<br>(V/μs) <sub>R</sub> | I <sub>PEAK</sub><br>(A) | I <sub>RMS</sub> <sup>(1)</sup><br>(A) |      | ESR <sup>(2)</sup><br>(mΩ) |      | tan δ <sup>(3)</sup><br>(10 <sup>-4</sup> ) |               | ORDERING CODE <sup>(4)</sup><br>MKP385e.... |
|-------------------------|----------------------------------------------------------------------|--------------------------------|------------|------------|------------------------------|--------------------------|----------------------------------------|------|----------------------------|------|---------------------------------------------|---------------|---------------------------------------------|
|                         |                                                                      |                                |            |            |                              |                          | 2                                      | 4    | 2                          | 4    | 2                                           | 4             |                                             |
|                         |                                                                      |                                |            |            |                              |                          | PINS                                   | PINS | PINS                       | PINS | PINS                                        | PINS          |                                             |
| 1600                    | U <sub>RAC</sub> = 550 V, U <sub>p-p</sub> = 1600 V, C-TOL. = ± 10 % |                                |            |            |                              |                          |                                        |      |                            |      |                                             |               |                                             |
|                         | 0.0039                                                               | 7.0 x 13.5 x 17.5              | 15         | -          | 2000                         | 7.8                      | 1.2                                    | -    | 139                        | -    | 20                                          | -             | 2391AKF[1]2[2]0                             |
|                         | 0.0047                                                               |                                |            |            |                              | 9.4                      | 1.3                                    | -    | 116                        | -    | 20                                          | -             | 2471AKF[1]2[2]0                             |
|                         | 0.0056                                                               |                                |            |            |                              | 11.2                     | 1.4                                    | -    | 102                        | -    | 20                                          | -             | 2561AKF[1]2[2]0                             |
|                         | 0.0068                                                               |                                |            |            |                              | 13.6                     | 1.6                                    | -    | 85                         | -    | 20                                          | -             | 2681AKF[1]2[2]0                             |
|                         | 0.0082                                                               |                                |            |            |                              | 16.4                     | 1.7                                    | -    | 73                         | -    | 20                                          | -             | 2821AKF[1]2[2]0                             |
|                         | 0.010                                                                |                                |            |            |                              | 20.0                     | 1.8                                    | -    | 63                         | -    | 25                                          | -             | 3101AKF[1]2[2]0                             |
|                         | 0.012                                                                |                                |            |            |                              | 24.0                     | 2.0                                    | -    | 53                         | -    | 25                                          | -             | 3121AKF[1]2[2]0                             |
|                         | 0.015                                                                | 8.5 x 15.0 x 17.5              |            |            |                              | 30.0                     | 2.4                                    | -    | 42                         | -    | 25                                          | -             | 3151AKF[1]2[2]0                             |
|                         | 0.018                                                                |                                |            |            |                              | 36.0                     | 2.7                                    | -    | 35                         | -    | 25                                          | -             | 3181AKF[1]2[2]0                             |
|                         | 0.022                                                                |                                |            |            |                              | 10.0 x 16.5 x 17.5       | 44.0                                   | 3.2  | -                          | 29   | -                                           | 25            | -                                           |
|                         | 0.027                                                                | 54.0                           |            |            |                              |                          | 3.5                                    | -    | 24                         | -    | 30                                          | -             | 3271AKF[1]2[2]0                             |
|                         | 0.033                                                                | 10.5 x 17.5 x 18.0             |            |            |                              | 66.0                     | 4.0                                    | -    | 20                         | -    | 30                                          | -             | 3331AKF[1]2[2]0                             |
|                         | 0.039                                                                | 11.0 x 18.5 x 18.0             |            |            |                              | 78.0                     | 4.4                                    | -    | 17                         | -    | 30                                          | -             | 3391AKF[1]2[2]0                             |
|                         | 0.010                                                                | 7.0 x 16.5 x 26.0              | 22.5       | -          | 1700                         | 17.0                     | 2.1                                    | -    | 73                         | -    | 25                                          | -             | 3101AKI[1]2[2]0                             |
|                         | 0.012                                                                | 8.5 x 18.0 x 26.0              |            |            |                              | 20.4                     | 2.5                                    | -    | 60                         | -    | 25                                          | -             | 3121AKI[1]2[2]0                             |
|                         | 0.015                                                                |                                |            |            |                              | 25.5                     | 2.6                                    | -    | 55                         | -    | 25                                          | -             | 3151AKI[1]2[2]0                             |
|                         | 0.018                                                                |                                |            |            |                              | 30.6                     | 2.9                                    | -    | 46                         | -    | 25                                          | -             | 3181AKI[1]2[2]0                             |
|                         | 0.022                                                                |                                |            |            |                              | 37.4                     | 3.1                                    | -    | 41                         | -    | 25                                          | -             | 3221AKI[1]2[2]0                             |
|                         | 0.027                                                                |                                |            |            |                              | 45.9                     | 3.4                                    | -    | 33                         | -    | 30                                          | -             | 3271AKI[1]2[2]0                             |
|                         | 0.033                                                                |                                |            |            |                              | 56.1                     | 3.5                                    | -    | 30                         | -    | 30                                          | -             | 3331AKI[1]2[2]0                             |
|                         | 0.039                                                                | 10.0 x 19.5 x 26.0             |            |            |                              | 66.3                     | 3.8                                    | -    | 26                         | -    | 30                                          | -             | 3391AKI[1]2[2]0                             |
|                         | 0.047                                                                |                                |            |            |                              | 79.9                     | 4.5                                    | -    | 21                         | -    | 30                                          | -             | 3471AKI[1]2[2]0                             |
|                         | 0.056                                                                |                                |            |            |                              | 95.2                     | 4.9                                    | -    | 18                         | -    | 35                                          | -             | 3561AKI[1]2[2]0                             |
|                         | 0.068                                                                |                                |            |            |                              | 115.6                    | 5.9                                    | -    | 15                         | -    | 35                                          | -             | 3681AKI[1]2[2]0                             |
|                         | 0.082                                                                | 12.0 x 22.0 x 26.0             |            |            |                              | 139.4                    | 6.4                                    | -    | 13                         | -    | 40                                          | -             | 3821AKI[1]2[2]0                             |
|                         | 0.10                                                                 |                                |            |            |                              | 170.0                    | 7.0                                    | -    | 11                         | -    | 40                                          | -             | 4101AKI[1]2[2]0                             |
|                         | 0.068                                                                | 11.0 x 21.0 x 31.0             | 27.5       | -          | 1200                         | 81.6                     | 5.1                                    | -    | 20                         | -    | 40                                          | -             | 3681AKK[1]2[2]0                             |
|                         | 0.082                                                                |                                |            |            |                              | 98.4                     | 5.6                                    | -    | 16                         | -    | 40                                          | -             | 3821AKK[1]2[2]0                             |
|                         | 0.10                                                                 |                                |            |            |                              | 120.0                    | 6.1                                    | -    | 14                         | -    | 45                                          | -             | 4101AKK[1]2[2]0                             |
|                         | 0.12                                                                 |                                |            |            |                              | 144.0                    | 7.2                                    | -    | 11                         | -    | 45                                          | -             | 4121AKK[1]2[2]0                             |
|                         | 0.15                                                                 | 15.0 x 25.0 x 31.0             |            |            |                              | 180.0                    | 8.6                                    | -    | 9                          | -    | 45                                          | -             | 4151AKK[1]2[2]0                             |
|                         | 0.18                                                                 |                                |            |            |                              | 216.0                    | 9.3                                    | -    | 8                          | -    | 50                                          | -             | 4181AKK[1]2[2]0                             |
|                         | 0.22                                                                 | 18.0 x 28.0 x 31.0             |            |            |                              | 264.0                    | 11.2                                   | -    | 7                          | -    | 60                                          | -             | 4221AKK[1]2[2]0                             |
|                         | 0.27                                                                 |                                |            |            |                              | 324.0                    | 12.2                                   | -    | 5                          | -    | 65                                          | -             | 4271AKK[1]2[2]0                             |
|                         | 0.33                                                                 | 21.0 x 31.0 x 31.0             |            |            |                              | 396.0                    | 14.4                                   | -    | 5                          | -    | 70                                          | -             | 4331AKK[1]2[2]0                             |
|                         | 0.39                                                                 | 18 x 32.5 x 41.5               | 37.5       | -          | 450                          | 175.5                    | 11.2                                   | -    | 8                          | -    | 25                                          | -             | 4391AKP[1]2T0                               |
|                         | 0.47                                                                 |                                |            |            |                              | 211.5                    | 12.2                                   | -    | 6                          | -    | 25                                          | -             | 4471AKP[1]2T0                               |
|                         | 0.56                                                                 | 10.2                           |            |            |                              | 252.0                    | 13.7                                   | 14.4 | 6                          | 6    | 25                                          | 25            | 4561AKP[1]4T0                               |
|                         | 0.68                                                                 |                                |            |            |                              | 306.0                    | 15.4                                   | 16.2 | 5                          | 5    | 30                                          | 30            | 4681AKP[1]4T0                               |
|                         | 0.82                                                                 |                                |            | 369.0      |                              | 17.0                     | 17.9                                   | 5    | 5                          | 35   | 35                                          | 4821AKP[1]4T0 |                                             |
|                         | 1.00                                                                 | 24 x 44 x 42                   |            | 450.0      |                              | 17.2                     | 18.0                                   | 5    | 5                          | 40   | 40                                          | 5101AKP[1]4T0 |                                             |
| 1.20                    | 540.0                                                                |                                |            | 18.2       |                              | 19.1                     | 5                                      | 5    | 50                         | 45   | 5121AKP[1]5T0                               |               |                                             |

## Notes

(1) I<sub>RMS</sub> at 85 °C ambient temperature and 100 kHz

(2) ESR at 85 °C and 100 kHz

(3) Maximum tan δ value at 100 kHz

(4) Please replace "[1]" by the lead length code and the "[2]" by the packaging type in accordance with section "Composition of Catalog Number"



| ELECTRICAL DATA AND ORDERING CODE |                                                                      |                                |                    |            |                              |                          |                                        |           |                            |                 |                                             |                 |                                             |                 |  |  |
|-----------------------------------|----------------------------------------------------------------------|--------------------------------|--------------------|------------|------------------------------|--------------------------|----------------------------------------|-----------|----------------------------|-----------------|---------------------------------------------|-----------------|---------------------------------------------|-----------------|--|--|
| U <sub>RDC</sub><br>(V)           | CAP.<br>(μF)                                                         | DIMENSION<br>w x h x l<br>(mm) | P1<br>(mm)         | P2<br>(mm) | du/dt<br>(V/μs) <sub>R</sub> | I <sub>PEAK</sub><br>(A) | I <sub>RMS</sub> <sup>(1)</sup><br>(A) |           | ESR <sup>(2)</sup><br>(mΩ) |                 | tan δ <sup>(3)</sup><br>(10 <sup>-4</sup> ) |                 | ORDERING CODE <sup>(4)</sup><br>MKP385e.... |                 |  |  |
|                                   |                                                                      |                                |                    |            |                              |                          | 2<br>PINS                              | 4<br>PINS | 2<br>PINS                  | 4<br>PINS       | 2<br>PINS                                   | 4<br>PINS       |                                             |                 |  |  |
| 2000                              | U <sub>RAC</sub> = 700 V, U <sub>p-p</sub> = 2000 V, C-TOL. = ± 10 % |                                |                    |            |                              |                          |                                        |           |                            |                 |                                             |                 |                                             |                 |  |  |
|                                   | 0.0010                                                               | 7.0 x 13.5 x 17.5              | 15                 | -          | 2900                         | 2.9                      | 0.7                                    | -         | 420                        | -               | 20                                          | -               | 2102AKF[1]2[2]0                             |                 |  |  |
|                                   | 0.0012                                                               |                                |                    |            |                              | 3.5                      | 0.8                                    | -         | 351                        | -               | 20                                          | -               | 2122AKF[1]2[2]0                             |                 |  |  |
|                                   | 0.0015                                                               |                                |                    |            |                              | 4.4                      | 0.9                                    | -         | 281                        | -               | 20                                          | -               | 2152AKF[1]2[2]0                             |                 |  |  |
|                                   | 0.0018                                                               |                                |                    |            |                              | 5.2                      | 0.9                                    | -         | 234                        | -               | 20                                          | -               | 2182AKF[1]2[2]0                             |                 |  |  |
|                                   | 0.0022                                                               |                                |                    |            |                              | 6.4                      | 1.0                                    | -         | 200                        | -               | 20                                          | -               | 2222AKF[1]2[2]0                             |                 |  |  |
|                                   | 0.0027                                                               |                                |                    |            |                              | 7.8                      | 1.1                                    | -         | 163                        | -               | 20                                          | -               | 2272AKF[1]2[2]0                             |                 |  |  |
|                                   | 0.0033                                                               |                                |                    |            |                              | 9.6                      | 1.2                                    | -         | 139                        | -               | 25                                          | -               | 2332AKF[1]2[2]0                             |                 |  |  |
|                                   | 0.0039                                                               |                                |                    |            |                              | 11.3                     | 1.3                                    | -         | 118                        | -               | 25                                          | -               | 2392AKF[1]2[2]0                             |                 |  |  |
|                                   | 0.0047                                                               |                                |                    |            |                              | 13.6                     | 1.4                                    | -         | 98                         | -               | 25                                          | -               | 2472AKF[1]2[2]0                             |                 |  |  |
|                                   | 0.0056                                                               |                                |                    |            |                              | 16.2                     | 1.5                                    | -         | 87                         | -               | 25                                          | -               | 2562AKF[1]2[2]0                             |                 |  |  |
|                                   | 0.0068                                                               | 8.5 x 15.0 x 17.5              |                    |            |                              | 19.7                     | 1.8                                    | -         | 72                         | -               | 25                                          | -               | 2682AKF[1]2[2]0                             |                 |  |  |
|                                   | 0.0082                                                               |                                |                    |            |                              | 23.8                     | 2.0                                    | -         | 59                         | -               | 25                                          | -               | 2822AKF[1]2[2]0                             |                 |  |  |
|                                   | 0.010                                                                |                                |                    |            |                              | 29.0                     | 2.2                                    | -         | 49                         | -               | 25                                          | -               | 3102AKF[1]2[2]0                             |                 |  |  |
|                                   | 0.012                                                                | 10.0 x 16.5 x 17.5             |                    |            |                              | 34.8                     | 2.6                                    | -         | 41                         | -               | 25                                          | -               | 3122AKF[1]2[2]0                             |                 |  |  |
|                                   | 0.015                                                                |                                |                    |            |                              | 43.5                     | 2.9                                    | -         | 33                         | -               | 25                                          | -               | 3152AKF[1]2[2]0                             |                 |  |  |
|                                   | 0.018                                                                | 10.5 x 17.5 x 18.0             |                    |            |                              | 52.2                     | 3.4                                    | -         | 28                         | -               | 25                                          | -               | 3182AKF[1]2[2]0                             |                 |  |  |
|                                   | 0.022                                                                | 11.0 x 18.5 x 18.0             |                    |            |                              | 63.8                     | 3.8                                    | -         | 23                         | -               | 25                                          | -               | 3222AKF[1]2[2]0                             |                 |  |  |
|                                   | 0.010                                                                | 8.5 x 18.0 x 26.0              | 22.5               | -          | 2500                         | 25.0                     | 2.3                                    | -         | 72                         | -               | 25                                          | -               | 3102AKI[1]2[2]0                             |                 |  |  |
|                                   | 0.012                                                                |                                |                    |            |                              | 30.0                     | 2.5                                    | -         | 60                         | -               | 25                                          | -               | 3122AKI[1]2[2]0                             |                 |  |  |
|                                   | 0.015                                                                |                                |                    |            |                              | 37.5                     | 2.6                                    | -         | 55                         | -               | 30                                          | -               | 3152AKI[1]2[2]0                             |                 |  |  |
|                                   | 0.018                                                                |                                |                    |            |                              | 45.0                     | 2.9                                    | -         | 46                         | -               | 30                                          | -               | 3182AKI[1]2[2]0                             |                 |  |  |
|                                   | 0.022                                                                |                                |                    |            |                              | 55.0                     | 3.2                                    | -         | 38                         | -               | 30                                          | -               | 3222AKI[1]2[2]0                             |                 |  |  |
|                                   | 0.027                                                                | 10.0 x 19.5 x 26.0             |                    |            |                              | 67.5                     | 3.7                                    | -         | 31                         | -               | 30                                          | -               | 3272AKI[1]2[2]0                             |                 |  |  |
|                                   | 0.033                                                                | 82.5                           |                    |            |                              | 4.1                      | -                                      | 26        | -                          | 30              | -                                           | 3332AKI[1]2[2]0 |                                             |                 |  |  |
|                                   | 0.039                                                                | 97.5                           |                    |            |                              | 4.9                      | -                                      | 22        | -                          | 30              | -                                           | 3392AKI[1]2[2]0 |                                             |                 |  |  |
|                                   | 0.047                                                                | 12.0 x 22.0 x 26.0             |                    |            |                              | 117.5                    | 5.3                                    | -         | 18                         | -               | 30                                          | -               | 3472AKI[1]2[2]0                             |                 |  |  |
|                                   | 0.056                                                                | 140.0                          |                    |            |                              | 5.8                      | -                                      | 15        | -                          | 35              | -                                           | 3562AKI[1]2[2]0 |                                             |                 |  |  |
|                                   | 0.022                                                                | 11.0 x 21.0 x 31.0             |                    |            |                              | 37.4                     | 3.5                                    | -         | 42                         | -               | 30                                          | -               | 3222AKK[1]2[2]0                             |                 |  |  |
|                                   | 0.027                                                                |                                |                    |            |                              | 45.9                     | 3.9                                    | -         | 34                         | -               | 30                                          | -               | 3272AKK[1]2[2]0                             |                 |  |  |
|                                   | 0.033                                                                |                                |                    |            |                              | 56.1                     | 4.0                                    | -         | 33                         | -               | 30                                          | -               | 3332AKK[1]2[2]0                             |                 |  |  |
|                                   | 0.039                                                                |                                |                    |            |                              | 66.3                     | 4.3                                    | -         | 28                         | -               | 30                                          | -               | 3392AKK[1]2[2]0                             |                 |  |  |
|                                   | 0.047                                                                |                                |                    |            |                              | 79.9                     | 4.7                                    | -         | 23                         | -               | 30                                          | -               | 3472AKK[1]2[2]0                             |                 |  |  |
|                                   | 0.056                                                                | 13.0 x 23.0 x 31.0             |                    |            |                              | 95.2                     | 5.5                                    | -         | 20                         | -               | 35                                          | -               | 3562AKK[1]2[2]0                             |                 |  |  |
|                                   | 0.068                                                                |                                | 115.6              | 6.1        | -                            | 16                       | -                                      | 35        | -                          | 3682AKK[1]2[2]0 |                                             |                 |                                             |                 |  |  |
|                                   | 0.082                                                                |                                | 15.0 x 25.0 x 31.0 |            |                              |                          | 139.4                                  | 7.1       | -                          | 14              | -                                           | 40              | -                                           | 3822AKK[1]2[2]0 |  |  |
|                                   | 0.10                                                                 | 170.0                          |                    |            |                              | 7.8                      | -                                      | 11        | -                          | 40              | -                                           | 4102AKK[1]2[2]0 |                                             |                 |  |  |
|                                   | 0.12                                                                 | 18.0 x 28.0 x 31.0             | 204.0              | 9.3        | -                            | 9                        | -                                      | 45        | -                          | 4122AKK[1]2[2]0 |                                             |                 |                                             |                 |  |  |
|                                   | 0.15                                                                 |                                | 255.0              | 10.3       | -                            | 8                        | -                                      | 45        | -                          | 4152AKK[1]2[2]0 |                                             |                 |                                             |                 |  |  |
|                                   | 0.18                                                                 |                                | 306.0              | 12.1       | -                            | 7                        | -                                      | 45        | -                          | 4182AKK[1]2[2]0 |                                             |                 |                                             |                 |  |  |
|                                   | 0.22                                                                 | 18.0 x 32.5 x 41.5             | 37.5               | -          | 600                          | 132.0                    | 11.0                                   | 11.6      | 8                          | 8               | 15                                          | 15              | 4222AKP[1]4T0                               |                 |  |  |
|                                   | 0.27                                                                 |                                |                    |            |                              | 162.0                    | 11.2                                   | 11.8      | 8                          | 7               | 20                                          | 20              | 4272AKP[1]4T0                               |                 |  |  |
|                                   | 0.33                                                                 | 198.0                          |                    |            |                              | 12.6                     | 13.2                                   | 7         | 7                          | 20              | 20                                          | 4332AKP[1]4T0   |                                             |                 |  |  |
|                                   | 0.39                                                                 | 234.0                          |                    |            |                              | 14.2                     | 14.9                                   | 6         | 6                          | 20              | 20                                          | 4392AKP[1]4T0   |                                             |                 |  |  |
|                                   | 0.47                                                                 | 282.0                          |                    |            |                              | 15.6                     | 16.4                                   | 6         | 6                          | 25              | 25                                          | 4472AKP[1]4T0   |                                             |                 |  |  |
|                                   | 0.56                                                                 | 336.0                          |                    | 16.1       |                              | 17.0                     | 5                                      | 5         | 25                         | 25              | 4562AKP[1]4T0                               |                 |                                             |                 |  |  |
| 0.68                              | 408.0                                                                | 17.7                           |                    | 18.6       |                              | 5                        | 5                                      | 30        | 30                         | 4682AKP[1]5T0   |                                             |                 |                                             |                 |  |  |
|                                   |                                                                      |                                |                    | 10.2       |                              |                          |                                        |           |                            |                 |                                             |                 |                                             |                 |  |  |
|                                   |                                                                      |                                |                    | 20.3       |                              |                          |                                        |           |                            |                 |                                             |                 |                                             |                 |  |  |

## Notes

(1) I<sub>RMS</sub> at 85 °C ambient temperature and 100 kHz

(2) ESR at 85 °C and 100 kHz

(3) Maximum tan δ value at 100 kHz

(4) Please replace "[1]" by the lead length code and the "[2]" by the packaging type in accordance with section "Composition of Catalog Number"



## ELECTRICAL DATA AND ORDERING CODE

| U <sub>RDC</sub><br>(V) | CAP.<br>(μF)                                                         | DIMENSION<br>w x h x l<br>(mm) | P1<br>(mm) | P2<br>(mm) | du/dt<br>(V/μs) <sub>R</sub> | I <sub>PEAK</sub><br>(A) | I <sub>RMS</sub> <sup>(1)</sup><br>(A) |           | ESR <sup>(2)</sup><br>(mΩ) |           | tan δ <sup>(3)</sup><br>(10 <sup>-4</sup> ) |                 | ORDERING CODE <sup>(4)</sup><br>MKP385e.... |
|-------------------------|----------------------------------------------------------------------|--------------------------------|------------|------------|------------------------------|--------------------------|----------------------------------------|-----------|----------------------------|-----------|---------------------------------------------|-----------------|---------------------------------------------|
|                         |                                                                      |                                |            |            |                              |                          | 2<br>PINS                              | 4<br>PINS | 2<br>PINS                  | 4<br>PINS | 2<br>PINS                                   | 4<br>PINS       |                                             |
| 2500                    | U <sub>RAC</sub> = 800 V, U <sub>p-p</sub> = 2250 V, C-TOL. = ± 10 % |                                |            |            |                              |                          |                                        |           |                            |           |                                             |                 |                                             |
|                         | 0.0010                                                               | 7.0 x 16.5 x 26.0              | 22.5       | -          | 2500                         | 2.5                      | 0.8                                    | -         | 493                        | -         | 20                                          | -               | 2102BKI[1]2[2]0                             |
|                         | 0.0012                                                               |                                |            |            |                              | 3.0                      | 0.9                                    | -         | 411                        | -         | 20                                          | -               | 2122BKI[1]2[2]0                             |
|                         | 0.0015                                                               |                                |            |            |                              | 8.5 x 18.0 x 26.0        | 3.8                                    | 1.1       | -                          | 338       | -                                           | 20              | -                                           |
|                         | 0.0018                                                               | 4.5                            |            |            |                              |                          | 1.2                                    | -         | 281                        | -         | 20                                          | -               | 2182BKI[1]2[2]0                             |
|                         | 0.0022                                                               | 5.5                            |            |            |                              |                          | 1.3                                    | -         | 232                        | -         | 25                                          | -               | 2222BKI[1]2[2]0                             |
|                         | 0.0027                                                               | 6.8                            |            |            |                              |                          | 1.3                                    | -         | 213                        | -         | 25                                          | -               | 2272BKI[1]2[2]0                             |
|                         | 0.0033                                                               | 8.3                            |            |            |                              |                          | 1.5                                    | -         | 175                        | -         | 25                                          | -               | 2332BKI[1]2[2]0                             |
|                         | 0.0039                                                               | 9.8                            |            |            |                              |                          | 1.5                                    | -         | 160                        | -         | 25                                          | -               | 2392BKI[1]2[2]0                             |
|                         | 0.0047                                                               | 11.8                           |            |            |                              |                          | 1.7                                    | -         | 133                        | -         | 25                                          | -               | 2472BKI[1]2[2]0                             |
|                         | 0.0056                                                               | 14.0                           |            |            |                              | 1.8                      | -                                      | 112       | -                          | 25        | -                                           | 2562BKI[1]2[2]0 |                                             |
|                         | 0.0068                                                               | 10.0 x 19.5 x 26.0             |            |            |                              | 17.0                     | 2.2                                    | -         | 93                         | -         | 25                                          | -               | 2682BKI[1]2[2]0                             |
|                         | 0.0082                                                               |                                |            |            |                              | 20.5                     | 2.4                                    | -         | 77                         | -         | 25                                          | -               | 2822BKI[1]2[2]0                             |
|                         | 0.010                                                                |                                |            |            |                              | 25.0                     | 2.6                                    | -         | 65                         | -         | 25                                          | -               | 3102BKI[1]2[2]0                             |
|                         | 0.012                                                                | 12.0 x 22.0 x 26.0             |            |            |                              | 30.0                     | 3.1                                    | -         | 54                         | -         | 30                                          | -               | 3122BKI[1]2[2]0                             |
|                         | 0.015                                                                |                                |            |            |                              | 37.5                     | 3.5                                    | -         | 43                         | -         | 30                                          | -               | 3152BKI[1]2[2]0                             |
|                         | 0.018                                                                |                                |            |            |                              | 45.0                     | 3.9                                    | -         | 37                         | -         | 30                                          | -               | 3182BKI[1]2[2]0                             |
|                         | 0.015                                                                | 11.0 x 21.0 x 31.0             | 27.5       | -          | 1700                         | 25.5                     | 2.9                                    | -         | 60                         | -         | 30                                          | -               | 3152BKK[1]2[2]0                             |
|                         | 0.018                                                                |                                |            |            |                              | 30.6                     | 3.2                                    | -         | 51                         | -         | 30                                          | -               | 3182BKK[1]2[2]0                             |
|                         | 0.022                                                                |                                |            |            |                              | 37.4                     | 3.7                                    | -         | 42                         | -         | 30                                          | -               | 3222BKK[1]2[2]0                             |
|                         | 0.027                                                                | 13.0 x 23.0 x 31.0             |            |            |                              | 45.9                     | 4.1                                    | -         | 35                         | -         | 30                                          | -               | 3272BKK[1]2[2]0                             |
|                         | 0.033                                                                |                                |            |            |                              | 56.1                     | 4.8                                    | -         | 29                         | -         | 30                                          | -               | 3332BKK[1]2[2]0                             |
|                         | 0.039                                                                |                                |            |            |                              | 66.3                     | 5.2                                    | -         | 25                         | -         | 30                                          | -               | 3392BKK[1]2[2]0                             |
|                         | 0.047                                                                | 15.0 x 25.0 x 31.0             |            |            |                              | 79.9                     | 6.1                                    | -         | 22                         | -         | 30                                          | -               | 3472BKK[1]2[2]0                             |
|                         | 0.056                                                                |                                |            |            |                              | 95.2                     | 6.6                                    | -         | 19                         | -         | 35                                          | -               | 3562BKK[1]2[2]0                             |
|                         | 0.068                                                                |                                |            |            |                              | 18.0 x 28.0 x 31.0       | 115.6                                  | 7.7       | -                          | 16        | -                                           | 35              | -                                           |
|                         | 0.082                                                                | 139.4                          |            |            |                              |                          | 8.2                                    | -         | 14                         | -         | 40                                          | -               | 3822BKK[1]2[2]0                             |
|                         | 0.10                                                                 | 15.7 x 28.5 x 41.5             | -          | 1000       | 100.0                        |                          | 8.0                                    | -         | 11                         | -         | 10                                          | -               | 4102BKP[1]2T0                               |
|                         | 0.12                                                                 |                                |            |            | 18 x 32.5 x 41.5             | 120.0                    | 9.5                                    | -         | 10                         | -         | 10                                          | -               | 4122BKP[1]2T0                               |
|                         | 0.15                                                                 |                                |            |            | 18.5 x 35.5 x 43             | 150.0                    | 11.2                                   | 11.8      | 8                          | 8         | 10                                          | 10              | 4152BKP[1]4T0                               |
|                         | 0.18                                                                 | 21.5 x 38.5 x 42               | 37.5       |            | 10.2                         | 180.0                    | 12.4                                   | 13.0      | 8                          | 8         | 15                                          | 15              | 4182BKP[1]4T0                               |
|                         | 0.22                                                                 |                                |            |            |                              | 220.0                    | 13.7                                   | 14.4      | 6                          | 6         | 15                                          | 15              | 4222BKP[1]4T0                               |
|                         | 0.27                                                                 |                                |            |            |                              | 270.0                    | 15.5                                   | 16.2      | 6                          | 6         | 15                                          | 15              | 4272BKP[1]4T0                               |
|                         | 0.33                                                                 | 30 x 45 x 42                   |            |            |                              | 330.0                    | 17.5                                   | 18.3      | 5                          | 5         | 15                                          | 15              | 4332BKP[1]5T0                               |
| 0.39                    | 390.0                                                                |                                |            |            |                              | 18.2                     | 19.1                                   | 5         | 5                          | 15        | 15                                          | 4392BKP[1]5T0   |                                             |

## Notes

- (1) I<sub>RMS</sub> at 85 °C ambient temperature and 100 kHz  
 (2) ESR at 85 °C and 100 kHz  
 (3) Maximum tan δ value at 100 kHz  
 (4) Please replace "[1]" by the lead length code and the "[2]" by the packaging type in accordance with section "Composition of Catalog Number"

| PACKAGING INFORMATION             |                            |                        |                       |                        |                                       |
|-----------------------------------|----------------------------|------------------------|-----------------------|------------------------|---------------------------------------|
| DIMENSIONS <sup>(1)</sup><br>(mm) | MASS <sup>(2)</sup><br>(g) | d <sub>t</sub><br>(mm) | SPQ (pcs)             |                        |                                       |
|                                   |                            |                        | LOOSE IN BOX          |                        | REEL PACK <sup>(3)</sup>              |
|                                   |                            |                        | l <sub>t</sub> ≤ 5 mm | l <sub>t</sub> = 25 mm | H = 18.5 mm; P <sub>0</sub> = 12.7 mm |
| PITCH = 15 mm ± 0.4 mm            |                            |                        |                       |                        |                                       |
| 7.0 x 13.5 x 17.5                 | 1.8                        | 0.80 ± 0.08            | 750                   | 500                    | 800                                   |
| 8.5 x 15.0 x 17.5                 | 2.4                        | 0.80 ± 0.08            | 750                   | 500                    | 650                                   |
| 10.0 x 16.5 x 17.5                | 3                          | 0.80 ± 0.08            | 500                   | 450                    | 600                                   |
| 10.5 x 17.5 x 18.0                | 4                          | 0.80 ± 0.08            | 225                   | 400                    | 600                                   |
| 11.0 x 18.5 x 18.0                | 5                          | 0.80 ± 0.08            | 225                   | 350                    | 550                                   |
| PITCH = 22.5 mm ± 0.4 mm          |                            |                        |                       |                        |                                       |
| 7.0 x 16.5 x 26.0                 | 2.9                        | 0.80 ± 0.08            | 200                   | 250                    | 500                                   |
| 8.5 x 18.0 x 26.0                 | 3.8                        | 0.80 ± 0.08            | 200                   | 250                    | 450                                   |
| 10.0 x 19.5 x 26.0                | 6.8                        | 0.80 ± 0.08            | 200                   | 200                    | 350                                   |
| 12.0 x 22.0 x 26.0                | 7.8                        | 0.80 ± 0.08            | 150                   | 200                    | 300                                   |
| 12.5 x 22.5 x 26.5                | 10                         | 0.80 ± 0.08            | 140                   | 400                    | 300                                   |
| PITCH = 27.5 mm ± 0.4 mm          |                            |                        |                       |                        |                                       |
| 9.0 x 19.0 x 31.0                 | 5.5                        | 0.80 ± 0.08            | 100                   | 150                    | -                                     |
| 11.0 x 21.0 x 31.0                | 7.4                        | 0.80 ± 0.08            | 100                   | 125                    | -                                     |
| 13.0 x 23.0 x 31.0                | 9.2                        | 0.80 ± 0.08            | 100                   | 125                    | -                                     |
| 15.0 x 25.0 x 31.0                | 12.3                       | 0.80 ± 0.08            | 100                   | 125                    | -                                     |
| 18.0 x 28.0 x 31.0                | 16.1                       | 0.80 ± 0.08            | 100                   | 100                    | -                                     |
| 21.0 x 31.0 x 31.0                | 18.3                       | 0.80 ± 0.08            | 50                    | 75                     | -                                     |
| PITCH = 37.5 mm ± 0.4 mm          |                            |                        |                       |                        |                                       |
| 15.7 x 28.5 x 41.5                | 17.92                      | 0.95 ± 0.10            | 70                    | -                      | -                                     |
| 18.0 x 32.5 x 41.5                | 23.68                      | 0.95 ± 0.10            | 60                    | -                      | -                                     |
| 18.5 x 35.5 x 43.0                | 29.41                      | 0.95 ± 0.10            | 105                   | -                      | -                                     |
| 21.5 x 38.5 x 42.0                | 37.68                      | 0.95 ± 0.10            | 91                    | -                      | -                                     |
| 24.0 x 44.0 x 42.0                | 47.37                      | 0.95 ± 0.10            | 77                    | -                      | -                                     |
| 30.0 x 45.0 x 42.0                | 58.82                      | 0.95 ± 0.10            | 63                    | -                      | -                                     |
| PITCH = 57.5 mm ± 0.4 mm          |                            |                        |                       |                        |                                       |
| 35.0 x 50.0 x 57.5                | 99.0                       | 0.95 ± 0.10            | 40                    | -                      | -                                     |

**Notes**

- SPQ = Standard Packing Quantity
- (1) For tolerances see section "Space Requirements on Printed-Circuit Board"
- (2) Weight for short lead product only
- (3) H = in-tape height; P<sub>0</sub> = sprocket hole distance

**MOUNTING**
**Normal Use**

The capacitors are designed for mounting on printed-circuit boards. The capacitors packed in bandoleers are designed for mounting on 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)

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

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

- For original pitch = 15 mm the 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 on Printed-Circuit Board**

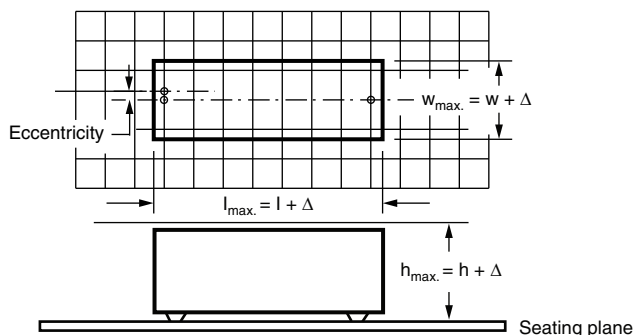
The maximum space for length (l<sub>max</sub>), width (w<sub>max</sub>), and height (h<sub>max</sub>) of film capacitors to take in account on the printed circuit board is shown in the drawings:

For products with pitch ≤ 15 mm, Δw = Δl = 0.3 mm and Δh = 0.1 mm

For products with 15 mm < pitch ≤ 27.5 mm, Δw = Δl = 0.5 mm and Δh = 0.1 mm

For products with pitch = 37.5 mm and 52.5 mm, Δw = Δl = 0.7 mm and Δh = 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 = 15 mm,  $\Delta l = 0.5$  mm and  $\Delta w = \Delta h = 0.5$  mm

For products with 15 mm < pitch < 27.5 mm,  $\Delta l = 1.0$  mm and  $\Delta w = \Delta h = 0.5$  mm

For products with pitch = 27.5 mm,  $\Delta w = \Delta l = \Delta h = 1.0$  mm

For products with pitch = 37.5 mm and 52.5 mm.  $\Delta w = \Delta l = 0.7$  mm and  $\Delta h = 0.5$  mm

## SOLDERING CONDITIONS

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

## STORAGE TEMPERATURE

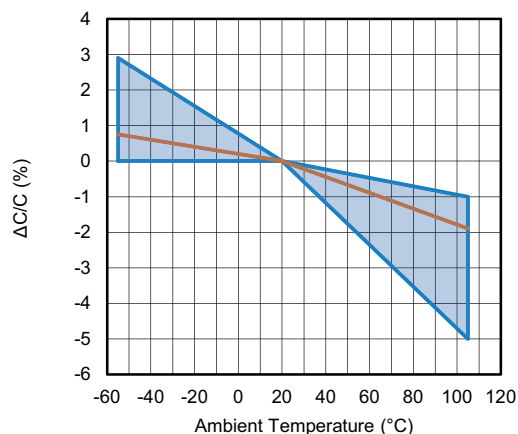
$T_{stg} = -25$  °C to  $+35$  °C with RH maximum 75 % without condensation.

## RATINGS AND CHARACTERISTICS REFERENCE CONDITIONS

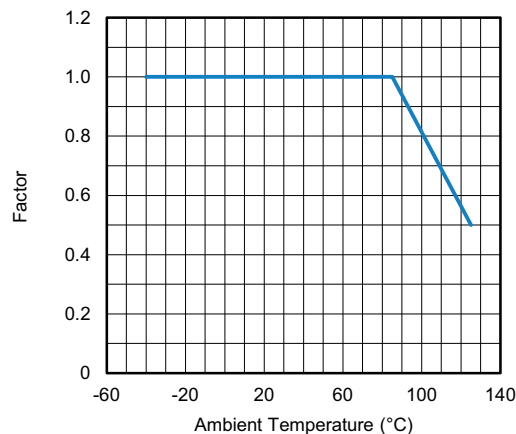
Unless otherwise specified, all electrical values apply to an ambient free temperature of  $23$  °C  $\pm 1$  °C, an atmospheric pressure of 86 kPa to 106 kPa, and a relative humidity of 50 %  $\pm 2$  %.

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 %.

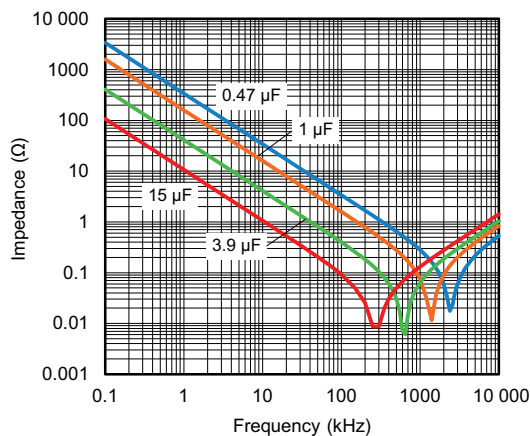
## CHARACTERISTICS



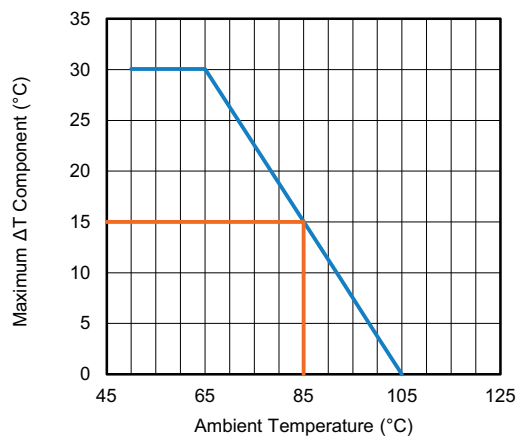
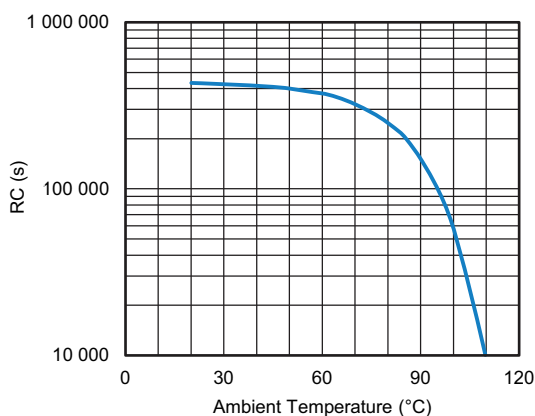
Capacitance as a function of ambient temperature (typical curve)  
(1 kHz)



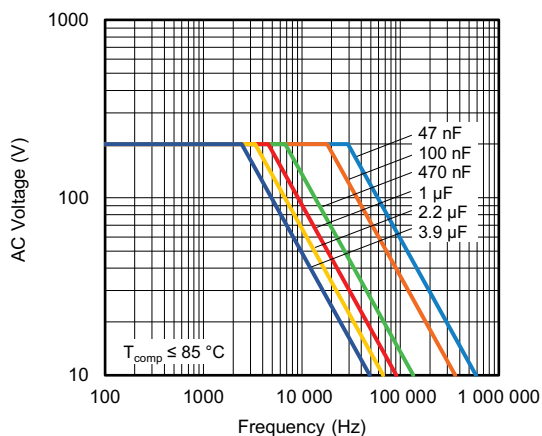
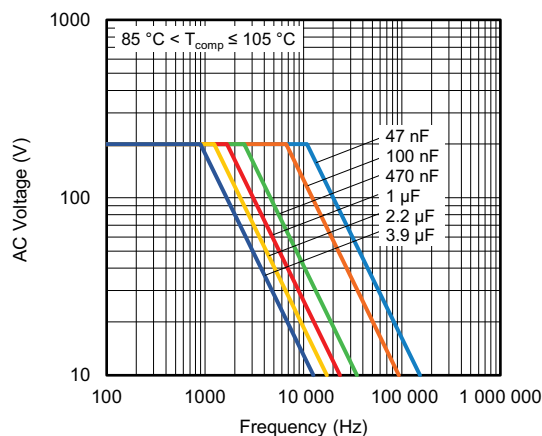
Max. DC and AC voltage as a function of temperature

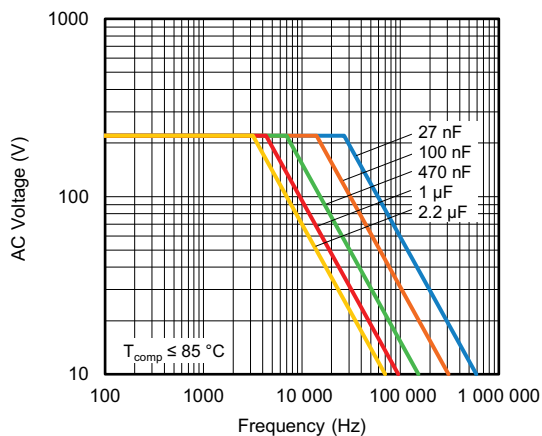
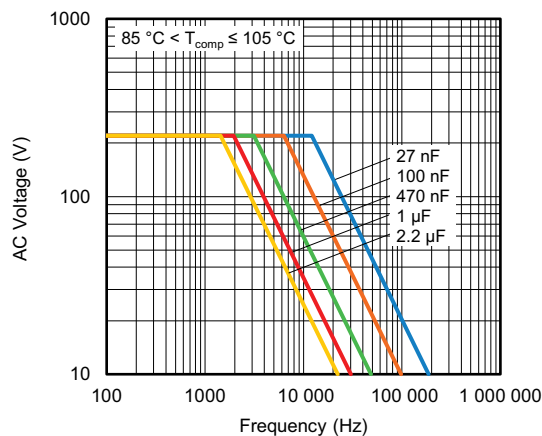
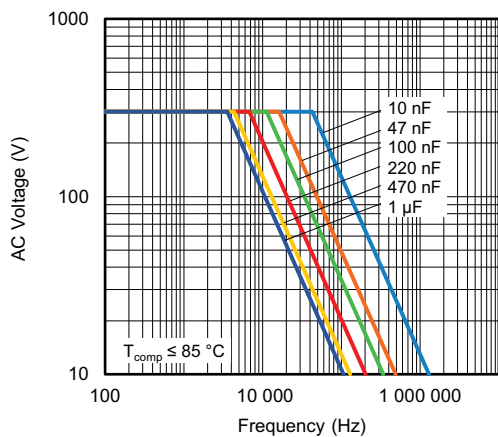
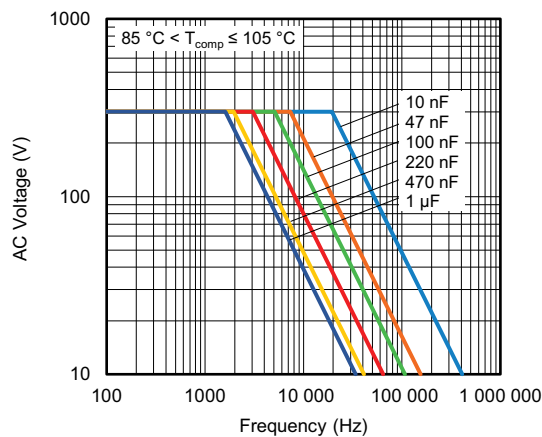
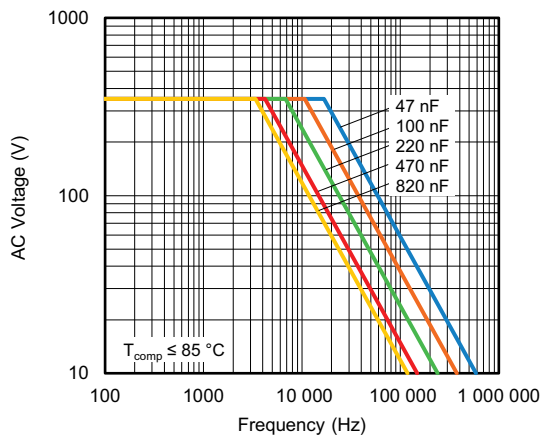
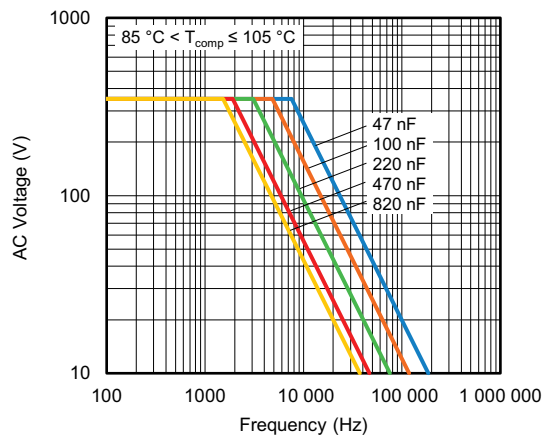


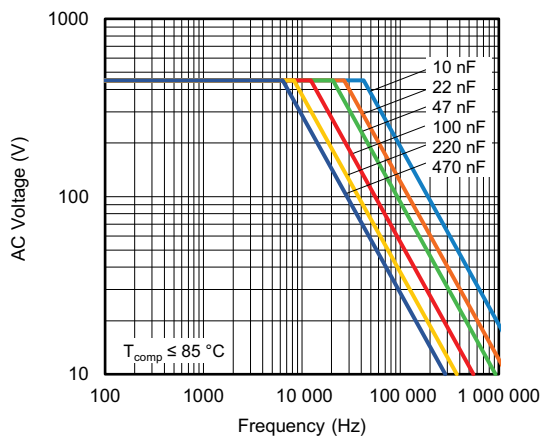
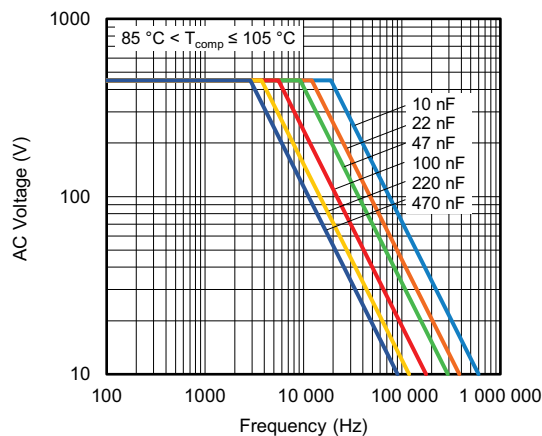
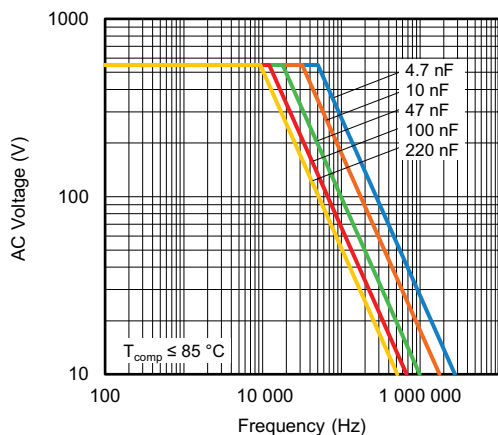
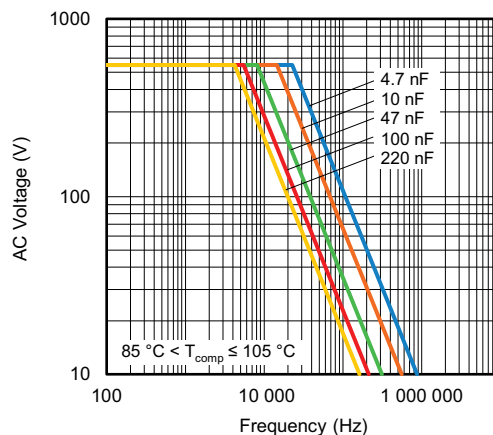
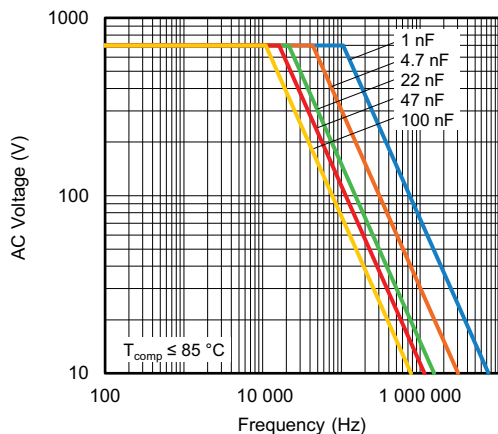
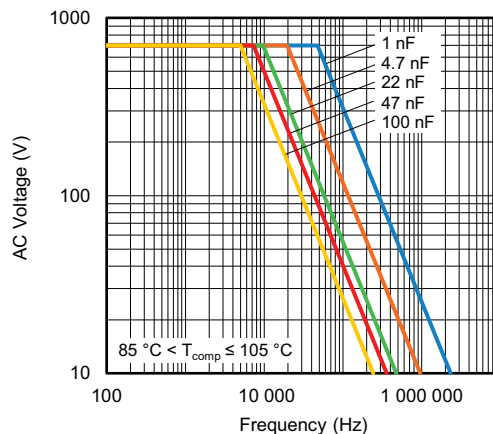
Impedance as a function of frequency (typical curve)


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


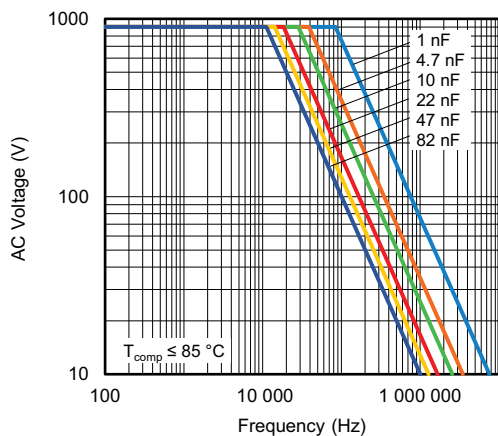
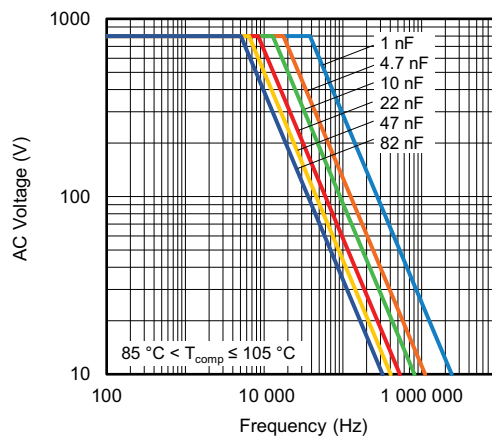
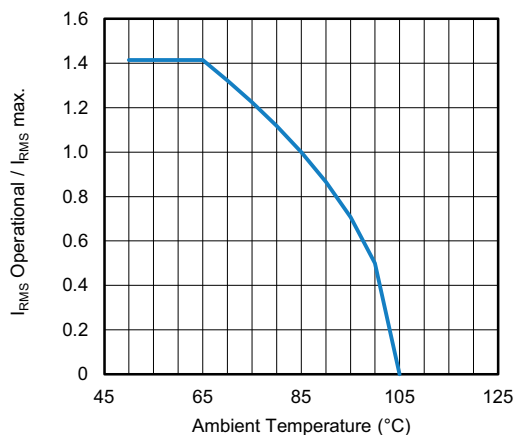
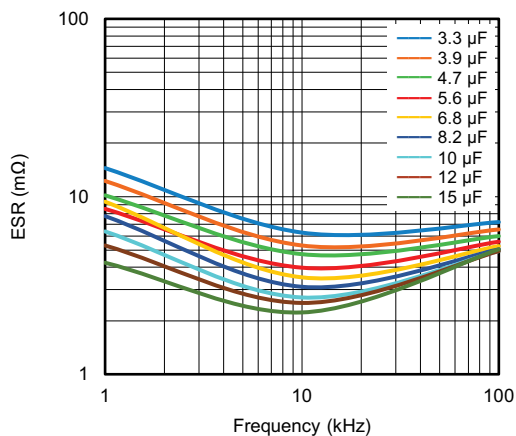
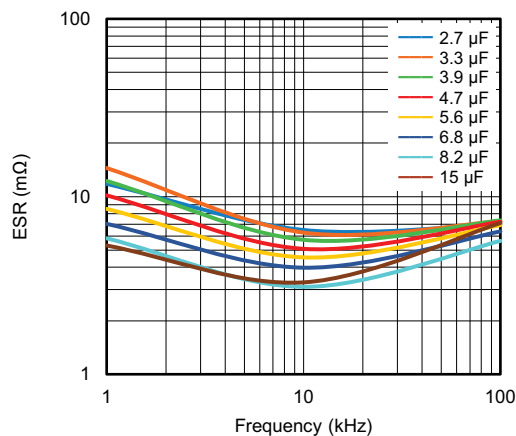
Insulation resistance as a function of ambient temperature (typical curve)

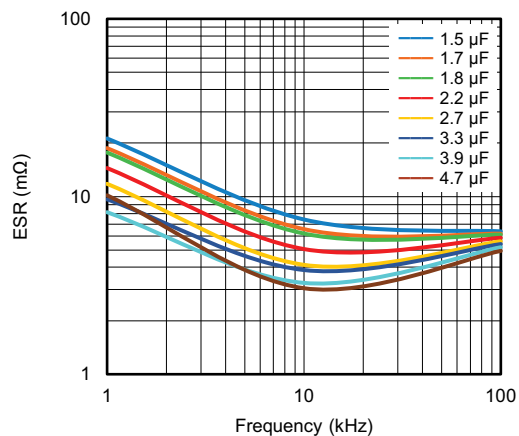

Maximum RMS voltage as a function of frequency (400 V<sub>DC</sub>)

Maximum RMS voltage as a function of frequency (400 V<sub>DC</sub>)


Maximum RMS voltage as a function of frequency (630 V<sub>DC</sub>)

Maximum RMS voltage as a function of frequency (630 V<sub>DC</sub>)

Maximum RMS voltage as a function of frequency (850 V<sub>DC</sub>)

Maximum RMS voltage as a function of frequency (850 V<sub>DC</sub>)

Maximum RMS voltage as a function of frequency (1000 V<sub>DC</sub>)

Maximum RMS voltage as a function of frequency (1000 V<sub>DC</sub>)

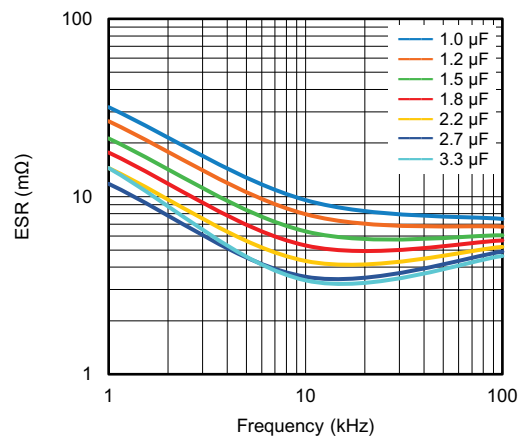

Maximum RMS voltage as a function of frequency (1250 V<sub>DC</sub>)

Maximum RMS voltage as a function of frequency (1250 V<sub>DC</sub>)

Maximum RMS voltage as a function of frequency (1600 V<sub>DC</sub>)

Maximum RMS voltage as a function of frequency (1600 V<sub>DC</sub>)

Maximum RMS voltage as a function of frequency (2000 V<sub>DC</sub>)

Maximum RMS voltage as a function of frequency (2000 V<sub>DC</sub>)



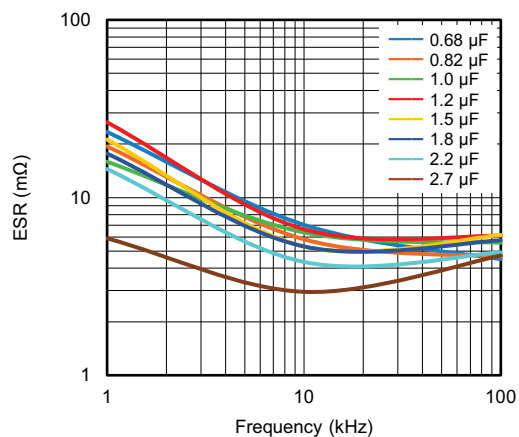

Maximum RMS voltage as a function of frequency (2500 V<sub>DC</sub>)

Maximum RMS voltage as a function of frequency (2500 V<sub>DC</sub>)

Maximum I<sub>RMS</sub> current in function of the ambient temperature  
(typical curve)

ESR as a function of frequency (400 V<sub>DC</sub>)  
(typical curve)

ESR as a function of frequency (630 V<sub>DC</sub>)  
(typical curve)



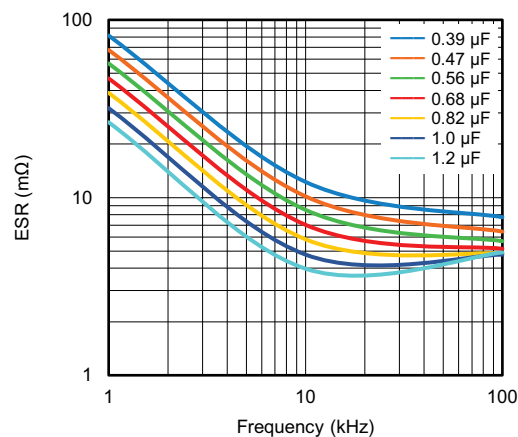
ESR as a function of frequency (850 V<sub>DC</sub>)  
(typical curve)



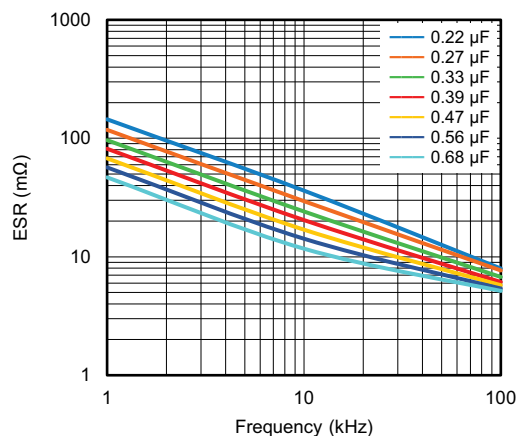
ESR as a function of frequency (1000 V<sub>DC</sub>)  
(typical curve)



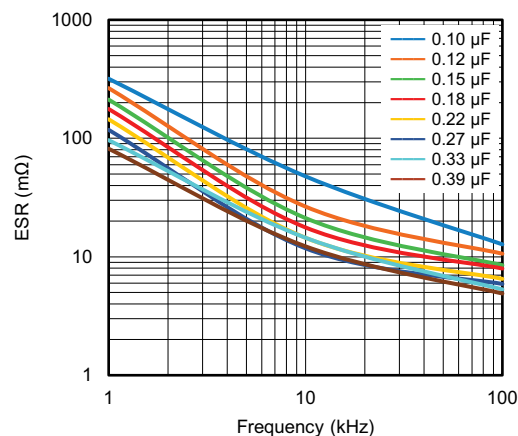
ESR as a function of frequency (1250 V<sub>DC</sub>)  
(typical curve)



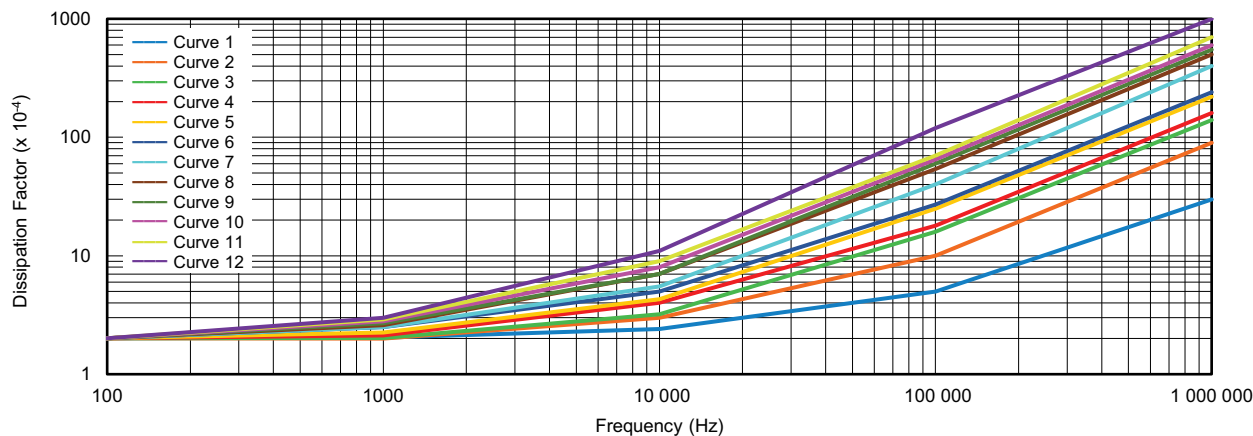
ESR as a function of frequency (1600 V<sub>DC</sub>)  
(typical curve)



ESR as a function of frequency (2000 V<sub>DC</sub>)  
(typical curve)



ESR as a function of frequency (2500 V<sub>DC</sub>)  
(typical curve)



Tangent of loss angle as a function of frequency  
(typical curves)

|                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>400 V:</b><br>$0.047 \leq C \leq 0.068 \mu\text{F}$ , curve 3<br>$0.082 \leq C \leq 0.18 \mu\text{F}$ , curve 4<br>$0.22 \leq C \leq 0.39 \mu\text{F}$ , curve 8<br>$0.47 \leq C \leq 1.2 \mu\text{F}$ , curve 11<br>$1.5 \leq C \leq 3.9 \mu\text{F}$ , curve 12 | <b>630 V:</b><br>$0.027 \leq C \leq 0.033 \mu\text{F}$ , curve 2<br>$0.039 \leq C \leq 0.1 \mu\text{F}$ , curve 3<br>$0.12 \leq C \leq 0.24 \mu\text{F}$ , curve 7<br>$0.27 \leq C \leq 1 \mu\text{F}$ , curve 9<br>$1.2 \leq C \leq 2.2 \mu\text{F}$ , curve 10 | <b>850 V:</b><br>$0.01 \leq C \leq 0.027 \mu\text{F}$ , curve 1<br>$0.033 \leq C \leq 0.068 \mu\text{F}$ , curve 3<br>$0.082 \leq C \leq 0.15 \mu\text{F}$ , curve 4<br>$0.18 \leq C \leq 0.68 \mu\text{F}$ , curve 5<br>$0.82 \leq C \leq 1.2 \mu\text{F}$ , curve 6 | <b>1000 V:</b><br>$0.018 \leq C \leq 0.047 \mu\text{F}$ , curve 1<br>$0.056 \leq C \leq 0.082 \mu\text{F}$ , curve 3<br>$0.1 \leq C \leq 0.27 \mu\text{F}$ , curve 4<br>$0.33 \leq C \leq 0.82 \mu\text{F}$ , curve 5 |
| <b>1250 V:</b><br>$0.0082 \leq C \leq 0.039 \mu\text{F}$ , curve 1<br>$0.047 \leq C \leq 0.082 \mu\text{F}$ , curve 3<br>$0.1 \leq C \leq 0.56 \mu\text{F}$ , curve 4                                                                                                | <b>1600 V:</b><br>$0.0039 \leq C \leq 0.012 \mu\text{F}$ , curve 1<br>$0.015 \leq C \leq 0.22 \mu\text{F}$ , curve 2<br>$0.27 \leq C \leq 0.33 \mu\text{F}$ , curve 3                                                                                            | <b>2000 V:</b><br>$0.001 \leq C \leq 0.012 \mu\text{F}$ , curve 1<br>$0.015 \leq C \leq 0.18 \mu\text{F}$ , curve 2                                                                                                                                                   | <b>2500 V:</b><br>$0.001 \leq C \leq 0.082 \mu\text{F}$ , curve 1                                                                                                                                                     |

**HEAT CONDUCTIVITY (G) AS A FUNCTION OF ORIGINAL PITCH AND CAPACITOR BODY THICKNESS IN mW/°C**

| W <sub>max.</sub><br>(mm) | HEAT CONDUCTIVITY (mW/°C) |               |               |               |               |
|---------------------------|---------------------------|---------------|---------------|---------------|---------------|
|                           | PITCH 15 mm               | PITCH 22.5 mm | PITCH 27.5 mm | PITCH 37.5 mm | PITCH 52.5 mm |
| 7.0                       | 14                        | 22            | -             | -             | -             |
| 8.5                       | 16                        | 25            | -             | -             | -             |
| 9.0                       | 19                        | -             | 29            | -             | -             |
| 10.0                      | 21                        | 29            | -             | -             | -             |
| 10.5 / 11.0               | 22                        | -             | 34            | -             | -             |
| 12.0                      | -                         | 34            | -             | -             | -             |
| 12.5 / 13.0               | -                         | 36            | 40            | -             | -             |
| 15.0                      | -                         | -             | 45            | -             | -             |
| 15.7                      | -                         | -             | -             | 55            | -             |
| 18.0                      | -                         | -             | 54            | 64            | -             |
| 18.5                      | -                         | -             | -             | 71            | -             |
| 21.0                      | -                         | -             | 63            | -             | -             |
| 21.5                      | -                         | -             | -             | 82            | -             |
| 24.0                      | -                         | -             | -             | 94            | -             |
| 25.0                      | -                         | -             | -             | -             | -             |
| 30.0                      | -                         | -             | -             | 108           | -             |
| 35.0                      | -                         | -             | -             | -             | 146           |

**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.

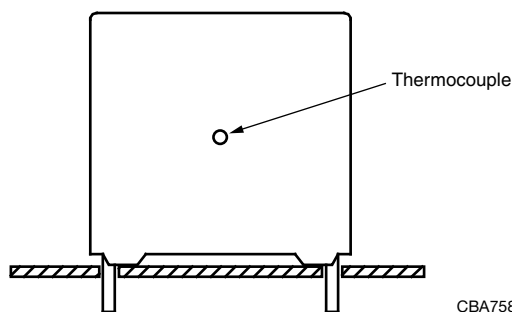
The power dissipation can be calculated according type detail specification [www.vishay.com/doc?28147](http://www.vishay.com/doc?28147)

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

- $\Delta T$  = 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:



CBA758

The temperature is measured in unloaded ( $T_{amb}$ ) and maximum loaded condition ( $T_C$ ).

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

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

## APPLICATION NOTES

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 ( $U_p$ ) shall not be greater than the rated DC voltage ( $U_{RDC}$ )
2. The peak-to-peak voltage ( $U_{p-p}$ ) shall not be greater than the maximum ( $U_{p-p}$ ) to avoid the ionization 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  $U_{RDC}$  and divided by the applied voltage.

For all other pulses following equation must be fulfilled:

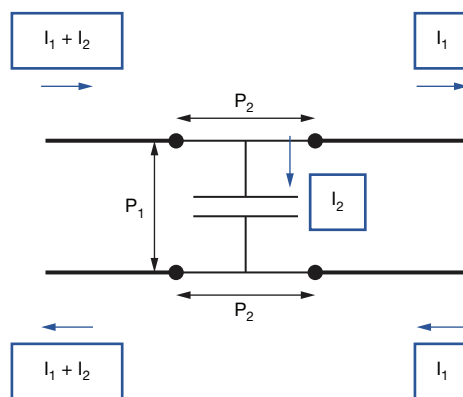
$$2 \times \int_0^T \left( \frac{dU}{dt} \right)^2 \times dt < U_{RDC} \times \left( \frac{dU}{dt} \right)_{rated}$$

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)

### Note

- See table "Voltage Ratings and Temperature"
7. For capacitors with multiple pins in some cases it is allowed to feed current through the pins additionally to the capacitor to improve filtering properties



$P_1$  and  $P_2$  are the pin distance dimensions as mentioned in the mechanical dimensions.

In this case the pins carry the currents  $I_1$  (= the fed through current) and  $I_2$  (= the capacitor current). Due to the additional heating up this fed through current must be limited to 10 % of the maximum allowed capacitor current  $I_2$ . For other currents contact [dc-film@vishay.com](mailto:dc-film@vishay.com).

**INSPECTION REQUIREMENTS****General Notes**

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

| <b>IEC 60384-17 - FIXED METALLIZED POLYPROPYLENE FILM DIELECTRIC AC AND PULSE CAPACITORS</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 Chapters “General data” of this specification                                                                                                                                                                                                                                                                      |
| 4.3.1 Initial measurements                                                                   | Capacitance<br>Tangent of loss angle:<br>$C \leq 1 \mu\text{F}$ at 100 kHz<br>$C > 1 \mu\text{F}$ at 10 kHz                    |                                                                                                                                                                                                                                                                                                                                    |
| 4.3 Robustness of terminations                                                               | Tensile: load 10 N; 10 s<br>Bending: load 5 N; 4 x 90°                                                                         | No visible damage                                                                                                                                                                                                                                                                                                                  |
| 4.4 Resistance to soldering heat                                                             | Method: 1 A<br>Solder bath: 280 °C ± 5 °C<br>Duration: 10 s                                                                    |                                                                                                                                                                                                                                                                                                                                    |
| 4.14 Component solvent resistance                                                            | Isopropylalcohol at room temperature<br>Method: 2<br>Immersion time: 5 min ± 0.5 min<br>Recovery time:<br>min. 1 h, max. 2 h   |                                                                                                                                                                                                                                                                                                                                    |
| 4.4.2 Final measurements                                                                     | Visual examination                                                                                                             | No visible damage<br>Legible marking                                                                                                                                                                                                                                                                                               |
|                                                                                              | Capacitance                                                                                                                    | $ \Delta C/C  \leq 1 \%$ of the value measured initially.                                                                                                                                                                                                                                                                          |
|                                                                                              | Tangent of loss angle                                                                                                          | Increase of tan $\delta$ :<br>$\leq 0.0005$ for: $C \leq 100 \text{ nF}$ at 100 kHz<br>$\leq 0.0010$ for: $100 \text{ nF} < C \leq 470 \text{ nF}$ at 100 kHz<br>$\leq 0.0015$ for: $470 \text{ nF} < C \leq 1 \mu\text{F}$ at 100 kHz<br>$\leq 0.0015$ for: $C > 1 \mu\text{F}$ at 10 kHz<br>Compared to values measured in 4.3.1 |
| <b>SUB-GROUP C1B OTHER PART OF SAMPLE OF SUB-GROUP C1</b>                                    |                                                                                                                                |                                                                                                                                                                                                                                                                                                                                    |
| 4.6.1 Initial measurements                                                                   | Capacitance<br>Tangent of loss angle:<br>$C \leq 1 \mu\text{F}$ at 100 kHz<br>$C > 1 \mu\text{F}$ at 10 kHz                    |                                                                                                                                                                                                                                                                                                                                    |
| 4.15 Solvent resistance of the marking                                                       | Isopropylalcohol at room temperature<br>Method: 1<br>Rubbing material: cotton wool<br>Immersion time: 5 min ± 0.5 min          | No visible damage<br>Legible marking                                                                                                                                                                                                                                                                                               |
| 4.6 Rapid change of temperature                                                              | $\theta A = -40 \text{ °C}$<br>$\theta B = +105 \text{ °C}$<br>5 cycles<br>Duration $t = 30 \text{ min}$<br>Visual examination | No visible damage                                                                                                                                                                                                                                                                                                                  |



| IEC 60384-17 - FIXED METALLIZED POLYPROPYLENE FILM DIELECTRIC AC AND PULSE CAPACITORS |                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SUB-CLAUSE NUMBER AND TEST                                                            | CONDITIONS                                                                                                                                                                                                            | PERFORMANCE REQUIREMENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>SUB-GROUP C1B OTHER PART OF SAMPLE OF SUB-GROUP C1</b>                             |                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 4.7. Vibration                                                                        | Mounting: see section "Mounting" for more information<br>Procedure B4<br>Frequency range: 10 Hz to 55 Hz.<br>Amplitude: 0.75 mm or acceleration 98 m/s <sup>2</sup> (whichever is less severe)<br>Total duration 6 h. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 4.7.2 Final inspection                                                                | Visual examination<br>Mounting: see section "Mounting" for more information                                                                                                                                           | No visible damage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 4.9 Shock                                                                             | Pulse shape: half sine<br>Acceleration: 490 m/s <sup>2</sup><br>Duration of pulse: 11 ms                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 4.9.3 Final measurements                                                              | Visual examination<br><br>Capacitance<br><br>Tangent of loss angle<br><br><br>Insulation resistance                                                                                                                   | No visible damage<br><br><br>$I\Delta C/C \leq 2\%$ of the value measured in 4.6.1.<br><br>Increase of $\tan \delta$ : $\leq 0.0005$<br>$\leq 0.0005$ for: $C \leq 100$ nF at 100 kHz<br>$\leq 0.0010$ for: $100$ nF $< C \leq 470$ nF at 100 kHz<br>$\leq 0.0015$ for: $470$ nF $< C \leq 1$ $\mu$ F at 100 kHz<br>$\leq 0.0015$ for: $C > 1$ $\mu$ F at 10 kHz<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 +105 °C<br>Duration: 16 h                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 4.10.3 Damp heat cyclic<br>Test Db, first cycle                                       |                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 4.10.4 Cold                                                                           | Temperature: -40 °C<br>Duration: 2 h                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 4.10.6 Damp heat cyclic<br>Test Db remaining cycles                                   |                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 4.10.6.2 Final measurements                                                           | Voltage proof = $U_{RDC}$ for 1 min within 15 min after removal from test chamber<br><br>Visual examination<br><br>Capacitance<br><br>Tangent of loss angle<br><br><br>Insulation resistance                          | No breakdown or flashover<br><br>No visible damage<br>Legible marking<br><br>$I\Delta C/C \leq 2\%$ of the value measured in 4.4.2 or 4.9.3<br><br>Increase of $\tan \delta$ :<br>$\leq 0.0005$ for: $C \leq 100$ nF at 100 kHz<br>$\leq 0.0010$ for: $100$ nF $< C \leq 470$ nF at 100 kHz<br>$\leq 0.0015$ for: $470$ nF $< C \leq 1$ $\mu$ F at 100 kHz<br>$\leq 0.0015$ for: $C > 1$ $\mu$ F at 10 kHz<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. |

**IEC 60384-17 - FIXED METALLIZED POLYPROPYLENE FILM DIELECTRIC AC AND PULSE CAPACITORS**

| SUB-CLAUSE NUMBER AND TEST             | CONDITIONS                                                                                                            | PERFORMANCE REQUIREMENTS                                                                                                                                        |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <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            | Capacitance<br>Tangent of loss angle at 1 kHz                                                                         |                                                                                                                                                                 |
| 4.11.3 Final measurements              | Voltage proof = $U_{RDC}$ for 1 min within<br>15 min after removal from test chamber                                  | No breakdown or flashover                                                                                                                                       |
|                                        | Visual examination                                                                                                    | No visible damage<br>Legible marking                                                                                                                            |
|                                        | Capacitance                                                                                                           | $ \Delta C/C  \leq 2\%$ of the value measured in<br>4.11.1.                                                                                                     |
|                                        | Tangent of loss angle                                                                                                 | Increase of $\tan \delta \leq 0.0025$ at 1 kHz<br>Compared to values measured in 4.11.1.                                                                        |
|                                        | Insulation resistance                                                                                                 | $\geq 50\%$ of values specified in section<br>“Insulation resistance” of this specification                                                                     |
| <b>SUB-GROUP C2A</b>                   |                                                                                                                       |                                                                                                                                                                 |
| 4.12A Damp heat steady state with load | 60 °C; 93 % RH load:<br>$U_{RDC}$ duration: 56 days                                                                   |                                                                                                                                                                 |
| 4.12.1A Initial measurements           | Capacitance<br>Tangent of loss angle at<br>for $C \leq 1\ \mu\text{F}$ at 10 kHz<br>for $C > 1\ \mu\text{F}$ at 1 kHz |                                                                                                                                                                 |
| 4.12.3A Final measurements             | Visual examination                                                                                                    | No visible damage<br>Legible marking                                                                                                                            |
|                                        | Capacitance                                                                                                           | $ \Delta C/C  \leq 10\%$ of the value measured in<br>4.12.1.                                                                                                    |
|                                        | Tangent of loss angle                                                                                                 | Increase of $\tan \delta$ :<br>$\leq 0.0240$ for $C \leq 1\ \mu\text{F}$ or<br>$\leq 0.0150$ for $C > 1\ \mu\text{F}$<br>Compared to values measured in 4.12.1. |
|                                        | Voltage proof<br>$U_{RDC}$ ; 1 min between terminations                                                               | No permanent breakdown or flashover                                                                                                                             |
|                                        | Insulation resistance                                                                                                 | $\geq 50\%$ of values specified in section<br>“Insulation resistance” of this specification                                                                     |





| IEC 60384-17 - FIXED METALLIZED POLYPROPYLENE FILM DIELECTRIC AC AND PULSE CAPACITORS |                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                |
|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SUB-CLAUSE NUMBER AND TEST                                                            | CONDITIONS                                                                                                                                                                                    | PERFORMANCE REQUIREMENTS                                                                                                                                                                                                                                                                       |
| <b>SUB-GROUP C3A</b>                                                                  |                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                |
| 4.12.1 Endurance                                                                      | Duration: 2000 h<br>Temperature: 85 °C<br>Voltage: $1.25 \times U_{RAC} V_{RMS}$ , 50 Hz<br>AND<br>Duration: 2000 h<br>Temperature: 105 °C<br>Voltage: $0.875 \times U_{RAC} V_{RMS}$ , 50 Hz |                                                                                                                                                                                                                                                                                                |
| 4.12.1.1 Initial measurements                                                         | Capacitance<br>Tangent of loss angle<br>$C \leq 1 \mu F$ at 100 kHz<br>$C > 1 \mu F$ at 10 kHz                                                                                                |                                                                                                                                                                                                                                                                                                |
| 4.12.1.3 Final measurements                                                           | Visual examination                                                                                                                                                                            | No visible damage<br>Legible marking                                                                                                                                                                                                                                                           |
|                                                                                       | Capacitance                                                                                                                                                                                   | $ \Delta C/C  \leq 5\%$ for $C > 10$ nF<br>$ \Delta C/C  \leq 8\%$ for $C \leq 10$ nF<br>Compared to values measured in 4.12.1.1                                                                                                                                                               |
|                                                                                       | Tangent of loss angle                                                                                                                                                                         | Increase of $\tan \delta$ :<br>$\leq 0.0005$ for: $C \leq 100$ nF at 100 kHz<br>$\leq 0.0010$ for: $100$ nF $< C \leq 470$ nF at 100 kHz<br>$\leq 0.0015$ for: $470$ nF $< C \leq 1 \mu F$ at 100 kHz<br>$\leq 0.0015$ for: $C > 1 \mu F$ at 10 kHz<br>Compared to values measured in 4.12.1.1 |
|                                                                                       | Insulation resistance                                                                                                                                                                         | $\geq 50\%$ of values specified in section "Insulation resistance" of this specification.                                                                                                                                                                                                      |
| <b>SUB-GROUP C3B</b>                                                                  |                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                |
| 4.12.2 Endurance test at 50 Hz alternating voltage                                    | $0.625 \times U_{RAC}$ at 125 °C<br>500 h                                                                                                                                                     |                                                                                                                                                                                                                                                                                                |
| 4.12.2.1 Initial measurements                                                         | Capacitance<br>Tangent of loss angle:<br>$C \leq 1 \mu F$ at 100 kHz<br>$C > 1 \mu F$ at 10 kHz                                                                                               |                                                                                                                                                                                                                                                                                                |
| 4.12.2.3 Final measurements                                                           | Visual examination                                                                                                                                                                            | No visible damage<br>Legible marking                                                                                                                                                                                                                                                           |
|                                                                                       | Capacitance                                                                                                                                                                                   | $ \Delta C/C  \leq 10\% + 100$ pF compared to values measured in 4.12.2.1                                                                                                                                                                                                                      |
|                                                                                       | Tangent of loss angle                                                                                                                                                                         | Increase of $\tan \delta$ :<br>$\leq 0.0005$ for: $C \leq 100$ nF at 100 kHz<br>$\leq 0.0010$ for: $100$ nF $< C \leq 470$ nF at 100 kHz<br>$\leq 0.0015$ for: $470$ nF $< C \leq 1 \mu F$ at 100 kHz<br>$\leq 0.0015$ for: $C > 1 \mu F$ at 10 kHz<br>Compared to values measured in 4.12.2.1 |
|                                                                                       | Insulation resistance                                                                                                                                                                         | $\geq 50\%$ of values specified in section "Insulation Resistance" of this specification.                                                                                                                                                                                                      |



| IEC 60384-17 - FIXED METALLIZED POLYPROPYLENE FILM DIELECTRIC AC AND PULSE CAPACITORS  |                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SUB-CLAUSE NUMBER AND TEST                                                             | CONDITIONS                                                                                                                               | PERFORMANCE REQUIREMENTS                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>SUB-GROUP C4</b>                                                                    |                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 4.2.6 Temperature characteristics<br>Initial measurements<br>Intermediate measurements | Capacitance<br>Capacitance at -40 °C<br>Capacitance at 20 °C<br>Capacitance at +125 °C                                                   | For -40 °C to +20 °C:<br>+1 % ≤ $\Delta C/C$ ≤ 3.75 % or<br>for 20 °C to 125 °C:<br>-7.5 % ≤ $\Delta C/C$ ≤ 0 %<br>Compared to values measured in 4.12.1.1                                                                                                                                                                                                                                                                               |
| Final measurements                                                                     | Capacitance<br><br>Insulation resistance                                                                                                 | As specified in section “Capacitance” of this specification<br><br>As specified in section “Insulation Resistance” of this specification                                                                                                                                                                                                                                                                                                 |
| 4.13 Charge and discharge                                                              | 10 000 cycles<br>Charged to $U_{RDC}$<br>Discharge resistance:<br>$R = \frac{U_{RDC}}{2.5 \times C (dU/dt)}$                             |                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 4.13.1 Initial measurements                                                            | Capacitance<br>Tangent of loss angle:<br>$C \leq 1 \mu F$ at 100 kHz<br>$1 \mu F < C \leq 10 \mu F$ at 10 kHz<br>$C > 10 \mu F$ at 1 kHz |                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 4.13.3 Final measurements                                                              | Capacitance<br><br>Tangent of loss angle<br><br>Insulation resistance                                                                    | $\Delta C/C \leq 1$ % compared to values measured in 4.13.1.<br><br>Increase of $\tan \delta$ :<br>≤ 0.0005 for: $C \leq 100$ nF at 100 kHz<br>≤ 0.0010 for: $100$ nF < $C \leq 470$ nF at 100 kHz<br>≤ 0.0015 for: $470$ nF < $C \leq 1 \mu F$ at 100 kHz<br>≤ 0.0015 for: $C > 1 \mu F$ at 10 kHz<br>Compared to values measured in 4.13.1<br><br>≥ 50 % of values specified in section “Insulation Resistance” of this specification. |

**AUTOMOTIVE AEC-Q200, REVISION D QUALIFICATION**

| STRESS                                 | REVISION | CONDITION                                                                                                                                                       | SAMPLE SIZE | PERFORMANCE REQUIREMENTS                                                                                                                                                                                                                                                                                                    |
|----------------------------------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. High temperature exposure (storage) | D        | Test as per MIL-STD 202, method 108<br>Temp.: 105 °C; unpowered<br>Duration: 1000 h                                                                             | 77          | $ \Delta C/C  \leq 5\%$<br>$\leq 0.0005$ for: $C \leq 100$ nF at 100 kHz<br>$\leq 0.0010$ for: $100$ nF $< C \leq 470$ nF at 100 kHz<br>$\leq 0.0015$ for: $470$ nF $< C \leq 1$ $\mu$ F at 100 kHz<br>$\leq 0.0015$ for: $C > 1$ $\mu$ F at 10 kHz<br>IR $> 50\%$ of initial specified value                               |
| 2. Temperature cycling                 | D        | Test as per JESD22, method JA-104<br>Total no. of cycles: 1000 cycles<br>Lower temp.: -40 °C<br>Upper temp.: +105 °C<br>Dwell each 30 min as per rev. D         | 77          | $ \Delta C/C  \leq 5\%$<br>Increase of tan $\delta$ :<br>$\leq 0.0005$ for: $C \leq 100$ nF at 100 kHz<br>$\leq 0.0010$ for: $100$ nF $< C \leq 470$ nF at 100 kHz<br>$\leq 0.0015$ for: $470$ nF $< C \leq 1$ $\mu$ F at 100 kHz<br>$\leq 0.0015$ for: $C > 1$ $\mu$ F at 10 kHz<br>IR $> 50\%$ of initial specified value |
| 3. Moisture resistance                 | D        | Test as per MIL-STD 202, method 106<br>10 cycles at 24 h/cycle<br>unpowered                                                                                     | 77          | $ \Delta C/C  \leq 5\%$<br>Increase of tan $\delta$ :<br>$\leq 0.0005$ for: $C \leq 100$ nF at 100 kHz<br>$\leq 0.0010$ for: $100$ nF $< C \leq 470$ nF at 100 kHz<br>$\leq 0.0015$ for: $470$ nF $< C \leq 1$ $\mu$ F at 100 kHz<br>$\leq 0.0015$ for: $C > 1$ $\mu$ F at 10 kHz<br>IR $> 50\%$ of initial specified value |
| 4. Biased humidity AC                  | D        | Test as per MIL-STD 202, method 103<br>Temp.: 40 °C; RH: 93 %; $U_{RAC}$<br>Duration: 1000 h                                                                    | 77          | $ \Delta C/C  \leq 5\%$<br>Increase of tan $\delta$ : $\leq 0.008$ at 1 kHz<br>IR $> 50\%$ of initial specified value                                                                                                                                                                                                       |
| 5. Biased humidity DC                  | D        | Test as per MIL-STD 202, method 103<br>Temp.: 40 °C; RH: 93 %; $U_{RDC}$<br>Duration: 1000 h                                                                    | 77          | $ \Delta C/C  \leq 5\%$<br>Increase of tan $\delta$ : $\leq 0.008$ at 1 kHz<br>IR $> 50\%$ of initial specified value                                                                                                                                                                                                       |
| 6. Operational life AC                 | D        | Test as per MIL-STD 202, method 108<br>Temp. = 105 °C; load = $U_{RAC}$<br>Duration: 1000 h                                                                     | 77          | $ \Delta C/C  \leq 5\%$<br>Increase of tan $\delta$ :<br>$\leq 0.0005$ for: $C \leq 100$ nF at 100 kHz<br>$\leq 0.0010$ for: $100$ nF $< C \leq 470$ nF at 100 kHz<br>$\leq 0.0015$ for: $470$ nF $< C \leq 1$ $\mu$ F at 100 kHz<br>$\leq 0.0015$ for: $C > 1$ $\mu$ F at 10 kHz<br>IR $> 50\%$ of initial specified value |
| 7. Operational life DC                 | D        | Test as per MIL-STD 202, method 108<br>Temp. = 105 °C; Load = $U_{RDC}$<br>Duration: 1000 h                                                                     | 77          | $ \Delta C/C  \leq 5\%$<br>Increase of tan $\delta$ :<br>$\leq 0.0005$ for: $C \leq 100$ nF at 100 kHz<br>$\leq 0.0010$ for: $100$ nF $< C \leq 470$ nF at 100 kHz<br>$\leq 0.0015$ for: $470$ nF $< C \leq 1$ $\mu$ F at 100 kHz<br>$\leq 0.0015$ for: $C > 1$ $\mu$ F at 10 kHz<br>IR $> 50\%$ of initial specified value |
| 8. Terminal strength (lead)            | D        | Test as per MIL-STD 202, method 211<br>Test leaded device lead integrity only.<br>- A (pull-test): 2.27 kg (10 s)<br>- C (wire-lead bend test): 227 g (3 x 3 s) | 30          | No visual damage                                                                                                                                                                                                                                                                                                            |
| 9. Resistance to solvents              | D        | MIL-STD-202 method 215<br>- Also aqueous chemical<br>- OKEM clean or equivalent.<br>Do not use banned solvents.                                                 | 5           | No visual damage<br>Legible marking                                                                                                                                                                                                                                                                                         |
| 10. Mechanical shock                   | D        | MIL-STD-202 method 213<br>100 g's; 6 ms;<br>half sine; 3.75 m/s                                                                                                 | 30          | No visual damage                                                                                                                                                                                                                                                                                                            |



| <b>AUTOMOTIVE AEC-Q200, REVISION D QUALIFICATION</b> |                 |                                                                                            |                    |                                                                                                                                                                                                                                                                                                                              |
|------------------------------------------------------|-----------------|--------------------------------------------------------------------------------------------|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>STRESS</b>                                        | <b>REVISION</b> | <b>CONDITION</b>                                                                           | <b>SAMPLE SIZE</b> | <b>PERFORMANCE REQUIREMENTS</b>                                                                                                                                                                                                                                                                                              |
| 11. Vibration                                        | D               | MIL-STD-202 method 204<br>5 g's for 20 min<br>12 cycles x 3 directions<br>10 Hz to 2000 Hz | 30                 | No visual damage                                                                                                                                                                                                                                                                                                             |
| 12. Resistance to soldering heat                     | D               | MIL-STD-202 method 210<br>Temp.: 280 °C; time: 10 s<br>solder within 1.5 mm of device body | 30                 | $ \Delta C/C  \leq 5\%$<br>Increase of $\tan \delta$ :<br>$\leq 0.0005$ for: $C \leq 100$ nF at 100 kHz<br>$\leq 0.0010$ for: $100$ nF $< C \leq 470$ nF at 100 kHz<br>$\leq 0.0015$ for: $470$ nF $< C \leq 1$ $\mu$ F at 100 kHz<br>$\leq 0.0015$ for: $C > 1$ $\mu$ F at 10 kHz<br>IR $> 50\%$ of initial specified value |
| 13. Solderability                                    | D               | J-STD-002<br>Leaded: method A at 235 °C,<br>category 3 (245 °C / 3 s)                      | 15                 | Good tinning as evidence by free flowing of the solder with wetting of terminations $> 95\%$                                                                                                                                                                                                                                 |
| 14. Flammability                                     | D               | UL-94<br>One flame application<br>Class B                                                  | 15                 | V-0 is acceptable.<br>Class B or C according IEC is also acceptable                                                                                                                                                                                                                                                          |



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