



# Interference Suppression Film Capacitor - Class X1 Radial MKP 330 V<sub>AC</sub> - Standard Across the Line



### FEATURES

- Complying with IEC 60384-14: AMD1 Grade IA (40 °C / 93 % R.H. / U<sub>RAC</sub> / 21 days)
- Small dimensions
- High voltage capability
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



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

### APPLICATIONS

For standard across the line X1 applications.

See also application note: [www.vishay.com/doc?28153](http://www.vishay.com/doc?28153)

| QUICK REFERENCE DATA                            |  |
|---|--|
| Capacitance range (E12 series)                  | 0.001 µF to 2.2 µF (preferred values according to E6)  |
| Capacitance tolerance                           | ± 20 %; ± 10 %; (± 5 % on request)   |
| Climatic testing class according to IEC 60068-1 | 55 / 110 / 56 / C for product volumes ≤ 1750 mm <sup>3</sup><br>55 / 110 / 56 / B for product volumes > 1750 mm <sup>3</sup>   |
| Rated AC voltage                                | 330 V <sub>AC</sub> ; 50 Hz to 60 Hz   |
| Permissible DC voltage                          | 800 V <sub>DC</sub> at 85 °C   |
| Maximum application temperature                 | 110 °C   |
| Reference standards                             | IEC 60384-14 ed-4 and EN 60384-14<br>IEC 60065 requires pass.flamm. class B for volumes > 1750 mm <sup>3</sup><br>CSA-E384-14; UL 60384-14<br>CQC GB/T6346.14-2015                         |
| Dielectric                                      | Polypropylene film   |
| Electrodes                                      | Metallized   |
| Construction                                    | Mono construction<br>  |
| Encapsulation                                   | Plastic case, epoxy resin sealed, flame retardant<br>UL-class 94 V-0   |
| Leads   | Tinned wire  |
| Marking   | C-value; tolerance; rated voltage; sub-class; manufacturer's type;<br>code for dielectric material; manufacturer location, year and week;<br>manufacturer's logo or name; safety approvals |

#### Note

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

| DIMENSIONS in millimeters |
|---------------------------|
|                           |

#### Note

- Ø d<sub>t</sub> ± 10 % of standard diameter specified



**COMPOSITION OF CATALOG NUMBER**



**Notes**

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



| SPECIFIC REFERENCE DATA  |                          |                          |
|--|--------------------------|--------------------------|
| DESCRIPTION  | VALUE                    |                          |
| Rated AC voltage ( $U_{RAC}$ )   | 330 V                    |                          |
| Permissible DC voltage ( $U_{RDC}$ )   | 800 V                    |                          |
| Tangent of loss angle  | At 1 kHz                 | At 10 kHz                |
| $C < 470$ nF   | $\leq 10 \times 10^{-4}$ | $\leq 20 \times 10^{-4}$ |
| $470$ nF $\leq C \leq 2.2$ $\mu$ F   | $\leq 20 \times 10^{-4}$ | $\leq 70 \times 10^{-4}$ |
| Rated voltage pulse slope ( $dU/dt$ ) <sub>R</sub> at 465 $V_{DC}$                           | 100 V/ $\mu$ s           |                          |
| R between leads, for $C \leq 0.33$ $\mu$ F at 100 V; 1 min                                   | $> 15\,000$ M $\Omega$   |                          |
| RC between leads, for $C > 0.33$ $\mu$ F at 100 V; 1 min                                     | $> 5000$ s               |                          |
| R between leads and case; 100 V; 1 min   | $> 30\,000$ M $\Omega$   |                          |
| Withstanding (DC) voltage (cut off current 10 mA) <sup>(1)</sup> ; rise time $\leq 1000$ V/s | 3400 V; 1 min            |                          |
| Withstanding (AC) voltage between leads and case   | 2160 V; 1 min            |                          |
| Maximum application temperature  | 110 °C                   |                          |

Note

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

| ELECTRICAL DATA AND ORDERING INFORMATION  |                    |  |                            |   |                                |      |                                 |      |  |      |
|---|--------------------|--|----------------------------|---|--------------------------------|------|---------------------------------|------|--|------|
| $U_{RAC}$<br>(V)  | CAP.<br>( $\mu$ F) | DIMENSIONS<br>w x h x l<br>(mm) <sup>(4)</sup> | MASS<br>(g) <sup>(3)</sup> | CATALOG NUMBER F339X1... AND PACKAGING  |                                |      |                                 |      |  |      |
|   |                    |  |                            | LOOSE IN BOX  |                                |      |                                 |      | TAPED REEL   |      |
|   |                    |  |                            | SHORT LEADS   |                                |      | LONG LEADS                      |      |  |      |
|   |                    |  |                            | $l_t = 3.5$ mm<br>+ 1 mm/- 0.5 mm<br>( $\leq 10$ mm)<br>or 3.5 mm $\pm$ 0.3 mm<br>( $\geq 15$ mm) | $l_t = 5.0$ mm<br>$\pm 1.0$ mm | SPQ  | $l_t = 25.0$ mm<br>$\pm 2.0$ mm | SPQ  | $\varnothing = 500$ mm <sup>(1)(2)</sup><br>H = 18.5 mm;<br>P <sub>0</sub> = 12.7 mm | SPQ  |
| <b>PITCH = 7.5 mm <math>\pm</math> 0.4 mm; <math>d_t = 0.50</math> mm <math>\pm</math> 0.05 mm; C-TOL. = <math>\pm 20</math> %</b>  |                    |  |                            |   |                                |      |                                 |      |  |      |
| 0.0010  | 4.0 x 9.0 x 10.0   | 10.0   | 0.4                        | 21033MCA2B0   | 21033MCM2B0                    | 1500 | 21033MCI2B0                     | 1000 | 21033MC02W0  | 2500 |
| 0.0015  |                    |  |                            | 21533MCA2B0   | 21533MCM2B0                    |      | 21533MCI2B0                     |      | 21533MC02W0  |      |
| 0.0022  |                    |  |                            | 22233MCA2B0   | 22233MCM2B0                    |      | 22233MCI2B0                     |      | 22233MC02W0  |      |
| 0.0033  | 5.0 x 10.5 x 10.0  | 10.0   | 0.4                        | 23333MCA2B0   | 23333MCM2B0                    | 1000 | 23333MCI2B0                     | 1250 | 23333MC02W0  | 2000 |
| 0.0047  | 6.0 x 11.5 x 10.0  | 10.0   | 0.8                        | 24733MCA2B0   | 24733MCM2B0                    | 750  | 24733MCI2B0                     | 1000 | 24733MC02W0  | 1900 |
| <b>PITCH = 10.0 mm <math>\pm</math> 0.4 mm; <math>d_t = 0.60</math> mm <math>\pm</math> 0.06 mm; C-TOL. = <math>\pm 20</math> %</b> |                    |  |                            |   |                                |      |                                 |      |  |      |
| 0.0010  | 4.0 x 10.0 x 12.5  | 12.5   | 0.6                        | 21033MDA2B0   | 21033MDM2B0                    | 1000 | 21033MDI2B0                     | 1250 | 21033MD02W0  | 1400 |
| 0.0015  |                    |  |                            | 21533MDA2B0   | 21533MDM2B0                    |      | 21533MDI2B0                     |      | 21533MD02W0  |      |
| 0.0022  |                    |  |                            | 22233MDA2B0   | 22233MDM2B0                    |      | 22233MDI2B0                     |      | 22233MD02W0  |      |
| 0.0033  |                    |  |                            | 23333MDA2B0   | 23333MDM2B0                    |      | 23333MDI2B0                     |      | 23333MD02W0  |      |
| 0.0047  |                    |  |                            | 24733MDA2B0   | 24733MDM2B0                    |      | 24733MDI2B0                     |      | 24733MD02W0  |      |
| 0.0068  |                    |  |                            | 26833MDA2B0   | 26833MDM2B0                    |      | 26833MDI2B0                     |      | 26833MD02W0  |      |
| 0.010   |                    |  |                            | 31033MDA2B0   | 31033MDM2B0                    |      | 31033MDI2B0                     |      | 31033MD02W0  |      |
| 0.015   |                    |  |                            | 31533MDA2B0   | 31533MDM2B0                    |      | 31533MDI2B0                     |      | 31533MD02W0  |      |
| 0.022   | 5.0 x 11.0 x 12.5  | 12.5   | 0.82                       | 32233MDA2B0   | 32233MDM2B0                    | 1000 | 32233MDI2B0                     | 1000 | 32233MD02W0  | 1100 |
| 0.033   | 6.0 x 12.0 x 12.5  | 12.5   | 1.1                        | 33333MDA2B0   | 33333MDM2B0                    | 750  | 33333MDI2B0                     | 750  | 33333MD02W0  | 900  |
| <b>PITCH = 15.0 mm <math>\pm</math> 0.4 mm; <math>d_t = 0.60</math> mm <math>\pm</math> 0.06 mm; C-TOL. = <math>\pm 20</math> %</b> |                    |  |                            |   |                                |      |                                 |      |  |      |
| 0.010   | 5.0 x 11.0 x 17.5  | 17.5   | 1.0                        | 31033MFP2B0   | 31033MFM2B0                    | 1250 | 31033MFI2B0                     | 1000 | 31033MF02W0  | 1100 |
| 0.015   |                    |  |                            | 31533MFP2B0   | 31533MFM2B0                    |      | 31533MFI2B0                     |      | 31533MF02W0  |      |
| 0.022   |                    |  |                            | 32233MFP2B0   | 32233MFM2B0                    |      | 32233MFI2B0                     |      | 32233MF02W0  |      |
| 0.033   |                    |  |                            | 33333MFP2B0   | 33333MFM2B0                    |      | 33333MFI2B0                     |      | 33333MF02W0  |      |
| 0.047   |                    |  |                            | 34733MFP2B0   | 34733MFM2B0                    |      | 34733MFI2B0                     |      | 34733MF02W0  |      |
| 0.068   | 6.0 x 12.0 x 17.5  | 17.5   | 1.4                        | 36833MFP2B0   | 36833MFM2B0                    | 1000 | 36833MFI2B0                     | 1000 | 36833MF02W0  | 900  |
| <b>PITCH = 15.0 mm <math>\pm</math> 0.4 mm; <math>d_t = 0.80</math> mm <math>\pm</math> 0.08 mm; C-TOL. = <math>\pm 20</math> %</b> |                    |  |                            |   |                                |      |                                 |      |  |      |
| 0.10  | 7.0 x 13.5 x 17.5  | 17.5   | 1.8                        | 41033MFP2B0   | 41033MFM2B0                    | 750  | 41033MFI2B0                     | 500  | 41033MF02W0  | 800  |
| 0.15  | 8.5 x 15.0 x 17.5  | 17.5   | 2.4                        | 41533MFP2B0   | 41533MFM2B0                    | 750  | 41533MFI2B0                     | 500  | 41533MF02W0  | 650  |
| 0.22  | 10.0 x 16.5 x 17.5 | 17.5   | 3.0                        | 42233MFP2B0   | 42233MFM2B0                    | 500  | 42233MFI2B0                     | 450  | 42233MF02W0  | 600  |



| ELECTRICAL DATA AND ORDERING INFORMATION  |                    |                                     |                   |  |             |             |                                     |             |            |                                      |
|---|--------------------|-------------------------------------|-------------------|--|-------------|-------------|-------------------------------------|-------------|------------|--------------------------------------|
| U <sub>RAC</sub><br>(V)   | CAP.<br>(µF)       | DIMENSIONS<br>w x h x l<br>(mm) (4) | MASS<br>(g) (3)   | CATALOG NUMBER F339X1... AND PACKAGING   |             |             |                                     |             |            |                                      |
|   |                    |                                     |                   | LOOSE IN BOX   |             |             |                                     |             | TAPED REEL |                                      |
|   |                    |                                     |                   | SHORT LEADS  |             |             | LONG LEADS                          |             |            |                                      |
|   |                    |                                     |                   | l <sub>t</sub> = 3.5 mm<br>+ 1 mm/- 0.5 mm<br>(≤ 10 mm)<br>or 3.5 mm ± 0.3 mm<br>(≥ 15 mm) |             |             | l <sub>t</sub> = 5.0 mm<br>± 1.0 mm |             | SPQ        | l <sub>t</sub> = 25.0 mm<br>± 2.0 mm |
| <b>PITCH = 22.5 mm ± 0.4 mm; d<sub>t</sub> = 0.80 mm ± 0.08 mm; C-TOL. = ± 20 %</b> |                    |                                     |                   |  |             |             |                                     |             |            |                                      |
| 0.10  | 6.0 x 15.5 x 26.0  | 2.4                                 | 41033MIP2T0       | 41033MIM2T0  | 300         | 41033MII2B0 | 250                                 | 41033MI02W0 | 600        |                                      |
| 0.15  |                    |                                     | 41533MIP2T0       | 41533MIM2T0  |             | 41533MII2B0 |                                     | 41533MI02W0 |            |                                      |
| 0.22  | 7.0 x 16.5 x 26.0  | 2.9                                 | 42233MIP2T0       | 42233MIM2T0  | 200         | 42233MII2B0 | 250                                 | 42233MI02W0 | 500        |                                      |
| 0.33  | 8.5 x 18.0 x 26.0  | 3.8                                 | 43333MIP2T0       | 43333MIM2T0  | 200         | 43333MII2B0 | 250                                 | 43333MI02W0 | 450        |                                      |
| 0.47  | 10.0 x 19.5 x 26.0 | 6.8                                 | 44733MIP2T0       | 44733MIM2T0  | 200         | 44733MII2B0 | 200                                 | 44733MI02W0 | 350        |                                      |
| 0.68  | 12.0 x 22.0 x 26.0 | 7.8                                 | 46833MIP2T0       | 46833MIM2T0  | 150         | 46833MII2B0 | 200                                 | 46833MI02W0 | 300        |                                      |
| 0.82  | 12.5 x 22.5 x 26.5 | 7.8                                 | 48233MIP2T0       | 48233MIM2T0  | 140         | 48233MII2B0 | 400                                 | 48233MI02W0 | 300        |                                      |
| <b>PITCH = 27.5 mm ± 0.4 mm; d<sub>t</sub> = 0.80 mm ± 0.08 mm; C-TOL. = ± 20 %</b> |                    |                                     |                   |  |             |             |                                     |             |            |                                      |
| 0.22  | 9.0 x 19.0 x 31.5  | 5.5                                 | 42233MKP2T0       | 42233MKM2T0  | 100         | 42233MKI2B0 | 150                                 | -           | -          |                                      |
| 0.33  |                    |                                     | 43333MKP2T0       | 43333MKM2T0  |             | 43333MKI2B0 |                                     |             |            |                                      |
| 0.47  |                    |                                     | 44733MKP2T0       | 44733MKM2T0  |             | 44733MKI2B0 |                                     |             |            |                                      |
| 0.68  | 11.0 x 21.0 x 31.0 | 7.4                                 | 46833MKP2T0       | 46833MKM2T0  | 100         | 46833MKI2B0 | 125                                 | -           | -          |                                      |
| 1.0   | 13.0 x 23.0 x 31.0 | 9.2                                 | 51033MKP2T0       | 51033MKM2T0  | 100         | 51033MKI2B0 | 125                                 | -           | -          |                                      |
| 1.5   | 18.0 x 28.0 x 31.5 | 16.1                                | 51533MKP2T0       | 51533MKM2T0  | 100         | 51533MKI2B0 | 100                                 | -           | -          |                                      |
| 2.2   | 21.0 x 31.0 x 31.0 | 20.3                                | 52233MKP2T0       | 52233MKM2T0  | 50          | 52233MKI2B0 | 75                                  | -           | -          |                                      |
| <b>PITCH = 7.5 mm ± 0.4 mm; d<sub>t</sub> = 0.50 mm ± 0.05 mm; C-TOL. = ± 10 %</b>  |                    |                                     |                   |  |             |             |                                     |             |            |                                      |
| 0.0010  | 4.0 x 9.0 x 10.0   | 0.4                                 | 21033KCA2B0       | 21033KCM2B0  | 1500        | 21033KCI2B0 | 1000                                | 21033KC02W0 | 2500       |                                      |
| 0.0012  |                    |                                     | 21233KCA2B0       | 21233KCM2B0  |             | 21233KCI2B0 |                                     | 21233KC02W0 |            |                                      |
| 0.0015  |                    |                                     | 21533KCA2B0       | 21533KCM2B0  |             | 21533KCI2B0 |                                     | 21533KC02W0 |            |                                      |
| 0.0018  |                    |                                     | 21833KCA2B0       | 21833KCM2B0  |             | 21833KCI2B0 |                                     | 21833KC02W0 |            |                                      |
| 0.0022  |                    |                                     | 22233KCA2B0       | 22233KCM2B0  |             | 22233KCI2B0 |                                     | 22233KC02W0 |            |                                      |
| 0.0027  |                    |                                     | 22733KCA2B0       | 22733KCM2B0  |             | 22733KCI2B0 |                                     | 22733KC02W0 |            |                                      |
| 0.0033  | 5.0 x 10.5 x 10.0  | 0.4                                 | 23333KCA2B0       | 23333KCM2B0  | 1000        | 23333KCI2B0 | 1250                                | 23333KC02W0 | 2000       |                                      |
| 0.0039  |                    |                                     | 23933KCA2B0       | 23933KCM2B0  |             | 23933KCI2B0 |                                     | 23933KC02W0 |            |                                      |
| 0.0047  | 6.0 x 11.5 x 10.0  | 0.8                                 | 24733KCA2B0       | 24733KCM2B0  | 750         | 24733KCI2B0 | 1000                                | 24733KC02W0 | 1900       |                                      |
| 0.0056  |                    |                                     | 25633KCA2B0       | 25633KCM2B0  |             | 25633KCI2B0 |                                     | 25633KC02W0 |            |                                      |
| <b>PITCH = 10.0 mm ± 0.4 mm; d<sub>t</sub> = 0.60 mm ± 0.06 mm; C-TOL. = ± 10 %</b> |                    |                                     |                   |  |             |             |                                     |             |            |                                      |
| 0.0010  | 4.0 x 10.0 x 12.5  | 0.6                                 | 21033KDA2B0       | 21033KDM2B0  | 1000        | 21033KDI2B0 | 1250                                | 21033KD02W0 | 1400       |                                      |
| 0.0012  |                    |                                     | 21233KDA2B0       | 21233KDM2B0  |             | 21233KDI2B0 |                                     | 21233KD02W0 |            |                                      |
| 0.0015  |                    |                                     | 21533KDA2B0       | 21533KDM2B0  |             | 21533KDI2B0 |                                     | 21533KD02W0 |            |                                      |
| 0.0018  |                    |                                     | 21833KDA2B0       | 21833KDM2B0  |             | 21833KDI2B0 |                                     | 21833KD02W0 |            |                                      |
| 0.0022  |                    |                                     | 22233KDA2B0       | 22233KDM2B0  |             | 22233KDI2B0 |                                     | 22233KD02W0 |            |                                      |
| 0.0027  |                    |                                     | 22733KDA2B0       | 22733KDM2B0  |             | 22733KDI2B0 |                                     | 22733KD02W0 |            |                                      |
| 0.0033  |                    |                                     | 23333KDA2B0       | 23333KDM2B0  |             | 23333KDI2B0 |                                     | 23333KD02W0 |            |                                      |
| 0.0039  |                    |                                     | 23933KDA2B0       | 23933KDM2B0  |             | 23933KDI2B0 |                                     | 23933KD02W0 |            |                                      |
| 0.0047  |                    |                                     | 24733KDA2B0       | 24733KDM2B0  |             | 24733KDI2B0 |                                     | 24733KD02W0 |            |                                      |
| 0.0056  |                    |                                     | 25633KDA2B0       | 25633KDM2B0  |             | 25633KDI2B0 |                                     | 25633KD02W0 |            |                                      |
| 0.0068  |                    |                                     | 26833KDA2B0       | 26833KDM2B0  |             | 26833KDI2B0 |                                     | 26833KD02W0 |            |                                      |
| 0.0082  |                    |                                     | 28233KDA2B0       | 28233KDM2B0  |             | 28233KDI2B0 |                                     | 28233KD02W0 |            |                                      |
| 0.010   |                    |                                     | 31033KDA2B0       | 31033KDM2B0  |             | 31033KDI2B0 |                                     | 31033KD02W0 |            |                                      |
| 0.012   |                    |                                     | 31233KDA2B0       | 31233KDM2B0  |             | 31233KDI2B0 |                                     | 31233KD02W0 |            |                                      |
| 0.015   |                    |                                     | 31533KDA2B0       | 31533KDM2B0  |             | 31533KDI2B0 |                                     | 31533KD02W0 |            |                                      |
| 0.018   |                    |                                     | 5.0 x 11.0 x 12.5 | 0.82   |             | 31833KDA2B0 |                                     | 31833KDM2B0 |            | 1000                                 |
| 0.022   | 32233KDA2B0        | 32233KDM2B0                         |                   |  | 32233KDI2B0 | 32233KD02W0 |                                     |             |            |                                      |
| 0.027   | 6.0 x 12.0 x 12.5  | 1.1                                 | 32733KDA2B0       | 32733KDM2B0  | 750         | 32733KDI2B0 | 750                                 | 32733KD02W0 | 900        |                                      |
| 0.033   |                    |                                     | 33333KDA2B0       | 33333KDM2B0  |             | 33333KDI2B0 |                                     | 33333KD02W0 |            |                                      |



**ELECTRICAL DATA AND ORDERING INFORMATION**

| U <sub>RAC</sub><br>(V)   | CAP.<br>(μF)       | DIMENSIONS<br>w x h x l<br>(mm) (4) | MASS<br>(g) (3) | CATALOG NUMBER F339X1... AND PACKAGING   |                                     |             |                                      |             |   |
|---|--------------------|-------------------------------------|-----------------|--|-------------------------------------|-------------|--------------------------------------|-------------|---|
|   |                    |                                     |                 | LOOSE IN BOX   |                                     |             |                                      | TAPED REEL  |   |
|   |                    |                                     |                 | SHORT LEADS  |                                     | LONG LEADS  |                                      |             |   |
|   |                    |                                     |                 | l <sub>t</sub> = 3.5 mm<br>+ 1 mm/- 0.5 mm<br>(≤ 10 mm)<br>or 3.5 mm ± 0.3 mm<br>(≥ 15 mm) | l <sub>t</sub> = 5.0 mm<br>± 1.0 mm | SPQ         | l <sub>t</sub> = 25.0 mm<br>± 2.0 mm | SPQ         | Ø = 500 mm (1)(2)<br>H = 18.5 mm;<br>P <sub>0</sub> = 12.7 mm |
| <b>PITCH = 15.0 mm ± 0.4 mm; d<sub>t</sub> = 0.60 mm ± 0.06 mm; C-TOL. = ± 10 %</b> |                    |                                     |                 |  |                                     |             |                                      |             |   |
| 0.010   | 5.0 x 11.0 x 17.5  | 1.0                                 | 31033KFP2B0     | 31033KFM2B0  | 1000                                | 31033KFI2B0 | 1000                                 | 31033KF02W0 | 1100  |
| 0.012   |                    |                                     | 31233KFP2B0     | 31233KFM2B0  |                                     | 31233KFI2B0 |                                      | 31233KF02W0 |   |
| 0.015   |                    |                                     | 31533KFP2B0     | 31533KFM2B0  |                                     | 31533KFI2B0 |                                      | 31533KF02W0 |   |
| 0.018   |                    |                                     | 31833KFP2B0     | 31833KFM2B0  |                                     | 31833KFI2B0 |                                      | 31833KF02W0 |   |
| 0.022   |                    |                                     | 32233KFP2B0     | 32233KFM2B0  |                                     | 32233KFI2B0 |                                      | 32233KF02W0 |   |
| 0.027   |                    |                                     | 32733KFP2B0     | 32733KFM2B0  |                                     | 32733KFI2B0 |                                      | 32733KF02W0 |   |
| 0.033   |                    |                                     | 33333KFP2B0     | 33333KFM2B0  |                                     | 33333KFI2B0 |                                      | 33333KF02W0 |   |
| 0.039   |                    |                                     | 33933KFP2B0     | 33933KFM2B0  |                                     | 33933KFI2B0 |                                      | 33933KF02W0 |   |
| 0.047   |                    |                                     | 34733KFP2B0     | 34733KFM2B0  |                                     | 34733KFI2B0 |                                      | 34733KF02W0 |   |
| 0.056   | 6.0 x 12.0 x 17.5  | 1.4                                 | 35633KFP2B0     | 35633KFM2B0  | 1000                                | 35633KFI2B0 | 1000                                 | 35633KF02W0 | 900   |
| 0.068   |                    |                                     | 36833KFP2B0     | 36833KFM2B0  |                                     | 36833KFI2B0 |                                      | 36833KF02W0 |   |
| <b>PITCH = 15.0 mm ± 0.4 mm; d<sub>t</sub> = 0.80 mm ± 0.08 mm; C-TOL. = ± 10 %</b> |                    |                                     |                 |  |                                     |             |                                      |             |   |
| 0.082   | 7.0 x 13.5 x 17.5  | 1.8                                 | 38233KFP2B0     | 38233KFM2B0  | 1000                                | 38233KFI2B0 | 500                                  | 38233KF02W0 | 800   |
| 0.100   |                    |                                     | 41033KFP2B0     | 41033KFM2B0  |                                     | 41033KFI2B0 |                                      | 41033KF02W0 |   |
| 0.120   | 8.5 x 15.0 x 17.5  | 2.4                                 | 41233KFP2B0     | 41233KFM2B0  | 1000                                | 41233KFI2B0 | 500                                  | 41233KF02W0 | 650   |
| 0.150   |                    |                                     | 41533KFP2B0     | 41533KFM2B0  |                                     | 41533KFI2B0 |                                      | 41533KF02W0 |   |
| 0.180   | 10.0 x 16.5 x 17.5 | 3.0                                 | 41833KFP2B0     | 41833KFM2B0  | 500                                 | 41833KFI2B0 | 500                                  | 41833KF02W0 | 600   |
| <b>PITCH = 22.5 mm ± 0.4 mm; d<sub>t</sub> = 0.80 mm ± 0.08 mm; C-TOL. = ± 10 %</b> |                    |                                     |                 |  |                                     |             |                                      |             |   |
| 0.10  | 6.0 x 15.5 x 26.0  | 2.4                                 | 41033KIP2T0     | 41033KIM2T0  | 300                                 | 41033KII2B0 | 250                                  | 41033KI02W0 | 600   |
| 0.12  |                    |                                     | 41233KIP2T0     | 41233KIM2T0  |                                     | 41233KII2B0 |                                      | 41233KI02W0 |   |
| 0.15  |                    |                                     | 41533KIP2T0     | 41533KIM2T0  |                                     | 41533KII2B0 |                                      | 41533KI02W0 |   |
| 0.18  | 7.0 x 16.5 x 26.0  | 2.9                                 | 41833KIP2T0     | 41833KIM2T0  | 200                                 | 41833KII2B0 | 250                                  | 41833KI02W0 | 500   |
| 0.22  |                    |                                     | 42233KIP2T0     | 42233KIM2T0  |                                     | 42233KII2B0 |                                      | 42233KI02W0 |   |
| 0.27  | 8.5 x 18.0 x 26.0  | 3.8                                 | 42733KIP2T0     | 42733KIM2T0  | 200                                 | 42733KII2B0 | 250                                  | 42733KI02W0 | 450   |
| 0.33  |                    |                                     | 43333KIP2T0     | 43333KIM2T0  |                                     | 43333KII2B0 |                                      | 43333KI02W0 |   |
| 0.39  | 10.0 x 19.5 x 26.0 | 6.8                                 | 43933KIP2T0     | 43933KIM2T0  | 200                                 | 43933KII2B0 | 200                                  | 43933KI02W0 | 350   |
| 0.47  | 12.0 x 22.0 x 26.0 | 7.8                                 | 44733KIP2T0     | 44733KIM2T0  | 150                                 | 44733KII2B0 | 200                                  | 44733KI02W0 | 300   |
| 0.56  |                    |                                     | 45633KIP2T0     | 45633KIM2T0  |                                     | 45633KII2B0 |                                      | 45633KI02W0 |   |
| 0.68  | 12.5 x 22.5 x 26.5 | 8.0                                 | 46833KIP2T0     | 46833KIM2T0  | 150                                 | 46833KII2B0 | 200                                  | 46833KI02W0 | 300   |
| <b>PITCH = 27.5 mm ± 0.4 mm; d<sub>t</sub> = 0.80 mm ± 0.08 mm; C-TOL. = ± 10 %</b> |                    |                                     |                 |  |                                     |             |                                      |             |   |
| 0.22  | 9.0 x 19.0 x 31.5  | 5.5                                 | 42233KKP2T0     | 42233KKM2T0  | 100                                 | 42233KKI2B0 | 150                                  | -           | -   |
| 0.27  |                    |                                     | 42733KKP2T0     | 42733KKM2T0  |                                     | 42733KKI2B0 |                                      |             |   |
| 0.33  |                    |                                     | 43333KKP2T0     | 43333KKM2T0  |                                     | 43333KKI2B0 |                                      |             |   |
| 0.39  |                    |                                     | 43933KKP2T0     | 43933KKM2T0  |                                     | 43933KKI2B0 |                                      |             |   |
| 0.47  | 11.0 x 21.0 x 31.0 | 7.4                                 | 44733KKP2T0     | 44733KKM2T0  | 100                                 | 44733KKI2B0 | 125                                  | -           | -   |
| 0.56  |                    |                                     | 45633KKP2T0     | 45633KKM2T0  |                                     | 45633KKI2B0 |                                      |             |   |
| 0.68  | 13.0 x 23.0 x 31.0 | 9.2                                 | 46833KKP2T0     | 46833KKM2T0  | 100                                 | 46833KKI2B0 | 125                                  | -           | -   |
| 0.82  |                    |                                     | 48233KKP2T0     | 48233KKM2T0  |                                     | 48233KKI2B0 |                                      |             |   |
| 1.0   | 15.0 x 25.0 x 31.5 | 12.3                                | 51033KKP2T0     | 51033KKM2T0  | 100                                 | 51033KKI2B0 | 125                                  | -           | -   |
| 1.2   |                    |                                     | 51233KKP2T0     | 51233KKM2T0  |                                     | 51233KKI2B0 |                                      |             |   |
| 1.5   | 18.0 x 28.0 x 31.5 | 16.1                                | 51533KKP2T0     | 51533KKM2T0  | 100                                 | 51533KKI2B0 | 100                                  | -           | -   |
| 1.8   | 21.0 x 31.0 x 31.0 | 20.3                                | 51833KKP2T0     | 51833KKM2T0  | 50                                  | 51833KKI2B0 | 75                                   | -           | -   |
| 2.2   |                    |                                     | 52233KKP2T0     | 52233KKM2T0  |                                     | 52233KKI2B0 |                                      |             |   |

**Notes**

- SPQ = Standard Packing Quantity
- (1) Reel diameter = 356 mm is available on request
- (2) H = in-tape height; P<sub>0</sub> = sprocket hole distance; for detailed specifications refer to "Packaging Information"
- (3) Weight for short lead product only
- (4) For tolerances see chapter "SPACE REQUIREMENTS FOR PRINTED-CIRCUIT BOARD APPLICATIONS AND DIMENSION TOLERANCES"

| APPROVALS   |                     |                |               |  |
|---|---------------------|----------------|---------------|--|
| SAFETY APPROVALS X1   | VOLTAGE             | VALUE          | FILE NUMBERS  | LINK   |
| EN 60384-14 (ENEC)<br>(= IEC 60384-14 ed-4)   | 330 V <sub>AC</sub> | 1 nF to 2.2 μF | 40031978      | <a href="http://www.vishay.com/doc?28229">www.vishay.com/doc?28229</a> |
| UL 60384-14   | 330 V <sub>AC</sub> | 1 nF to 2.2 μF | E354331B      | <a href="http://www.vishay.com/doc?28210">www.vishay.com/doc?28210</a> |
| CSA-E384-14   | 330 V <sub>AC</sub> | 1 nF to 2.2 μF | E354331B      | <a href="http://www.vishay.com/doc?28210">www.vishay.com/doc?28210</a> |
| CQC   | 330 V <sub>AC</sub> | 1 nF to 2.2 μF | L-16001150858 | <a href="http://www.vishay.com/doc?28235">www.vishay.com/doc?28235</a> |
|   |                     |                | F-12001067600 | <a href="http://www.vishay.com/doc?28236">www.vishay.com/doc?28236</a> |
| CB-test certificate   | 330 V <sub>AC</sub> | 1 nF to 2.2 μF | DE1-48009/M1  | <a href="http://www.vishay.com/doc?28218">www.vishay.com/doc?28218</a> |
| The ENEC-approval together with the CB-certificate replace all national marks of the following countries (they have already signed the ENEC-agreement): Austria; Belgium; Czech. Republic; Denmark; Finland; France; Germany; Greece; Hungary; Ireland; Italy; Luxembourg; Netherlands; Norway; Portugal; Slovenian; Spain; Sweden, Switzerland and United Kingdom. |                     |                |               |  |
|   |                     |                |               |  |

## MOUNTING

### Normal Use

The capacitors are designed for mounting on printed-circuit boards. The capacitors packed in bandoliers 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/docs?28139](http://www.vishay.com/docs?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:

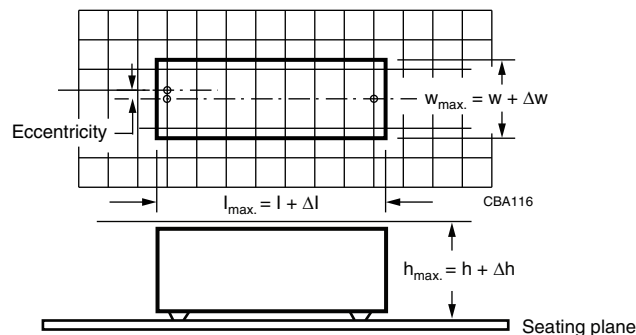
- For original pitch ≤ 15 mm the capacitors shall be mechanically fixed by the leads
- For larger pitches the capacitors shall be mounted in the same way and the body clamped

## SPACE REQUIREMENTS FOR PRINTED-CIRCUIT BOARD APPLICATIONS AND DIMENSION TOLERANCES

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

- For products with pitch ≤ 15 mm,  $\Delta w = \Delta l = 0.3$  mm and  $\Delta h = 0.1$  mm
- For products with 15 mm < pitch ≤ 27.5 mm,  $\Delta w = \Delta l = 0.5$  mm and  $\Delta h = 0.1$  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 ≤ 10 mm,  $\Delta l = 0.3$  mm and  $\Delta w = \Delta h = 0.3$  mm
- For products with pitch = 15mm,  $\Delta l = 0.5$  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



**SOLDERING CONDITIONS**

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

**STORAGE TEMPERATURE**

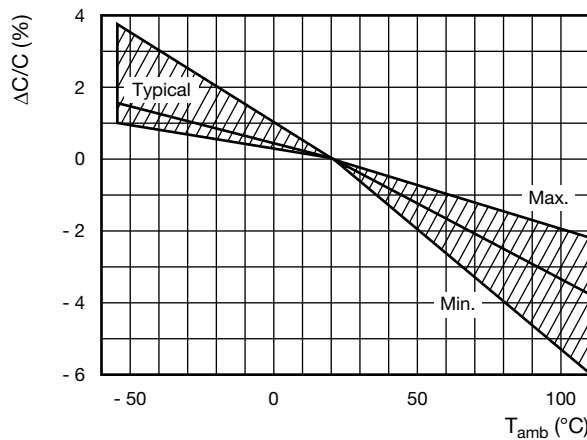
T<sub>stg</sub> = -25 °C to +35 °C with RH maximum 75 % without condensation

**RATINGS AND CHARACTERISTICS REFERENCE CONDITIONS**

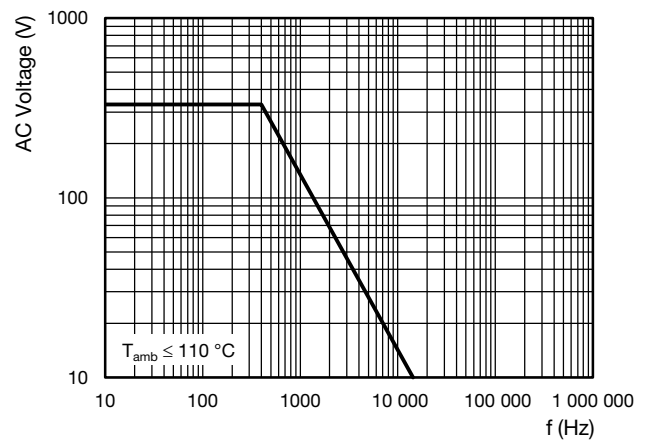
Unless otherwise specified, all electrical values apply to an ambient free temperature of 23 °C ± 1 °C, an atmospheric pressure of 86 kPa to 106 kPa and a relative humidity of 50 % ± 2 %.

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

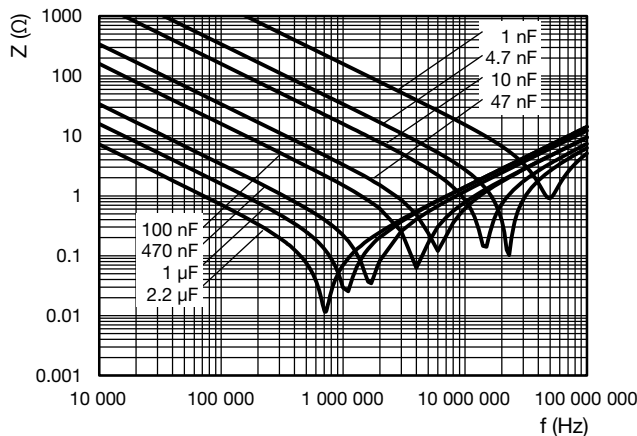
**CHARACTERISTICS**



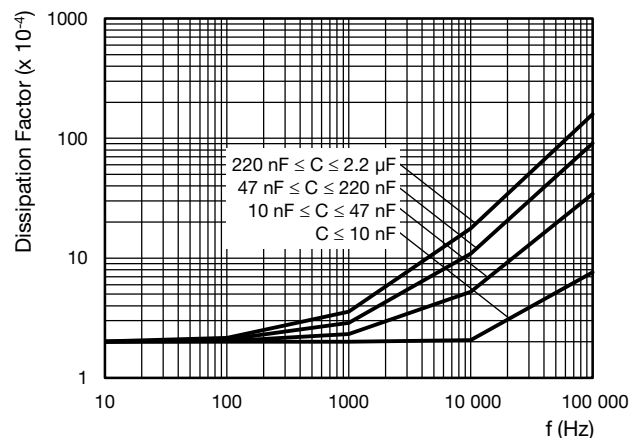
Capacitance as a function of ambient temperature (typical curve)



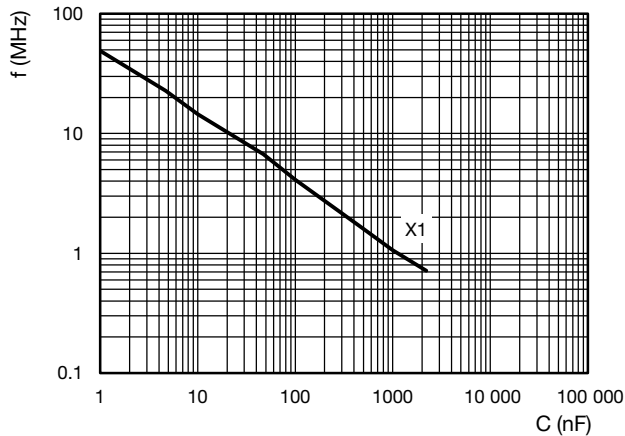
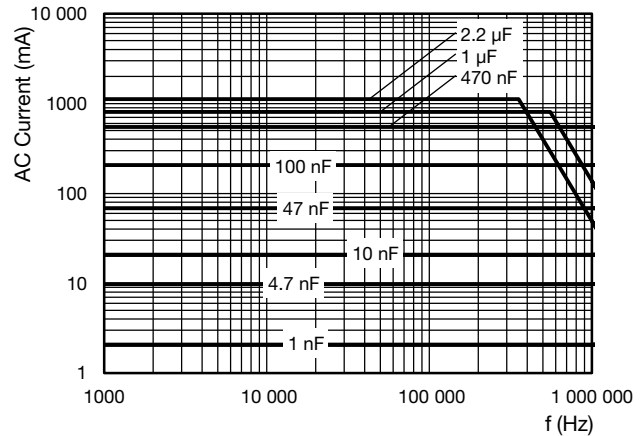
Max. RMS voltage as a function of frequency



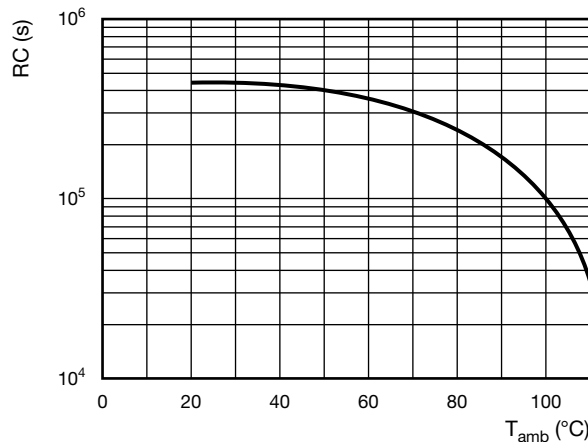
Impedance as a function of frequency (typical curve)



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


 Resonant frequency as a function of capacitance  
(typical curve)


Max. RMS current as a function of frequency


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

## APPLICATION NOTES

- For X1 electromagnetic interference suppression in **standard across the line applications** (50 Hz/60 Hz) with a maximum mains voltage of 330 V<sub>AC</sub>
- For series impedance applications we refer to the application note: [www.vishay.com/doc?28153](http://www.vishay.com/doc?28153)
- 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: [rfi@vishay.com](mailto:rfi@vishay.com)
- These capacitors are not intended for continuous pulse applications. For these situations, capacitors of the AC and pulse programs must be used
- The maximum ambient temperature must not exceed 110 °C
- Rated voltage pulse slope:  
if the pulse voltage is lower than the rated voltage, the values of the specific reference data can be multiplied by  $465 V_{DC}$  and divided by the applied voltage

## INSPECTION REQUIREMENTS

### General Notes

Sub-clause numbers of tests and performance requirements refer to the “Sectional Specification, Publication IEC 60384-14 ed-3 and Specific Reference Data”.





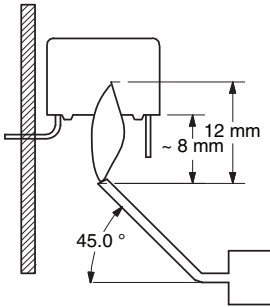
| <b>GROUP C INSPECTION REQUIREMENTS</b>                    |  |  |
|---|--|--|
| <b>SUB-CLAUSE NUMBER AND TEST</b>                         | <b>CONDITIONS</b>  | <b>PERFORMANCE REQUIREMENTS</b>  |
| <b>SUB-GROUP C1A PART OF SAMPLE OF SUB-GROUP C1</b>       |  |  |
| 4.1 Dimensions (detail)                                   |  | As specified in chapters "General Data" of this specification  |
| Initial measurements                                      | Capacitance<br>Tangent of loss angle at 10 kHz for $C \leq 1 \mu\text{F}$<br>Tangent of loss angle at 1 kHz for $C > 1 \mu\text{F}$  |  |
| 4.3 Robustness of terminations                            | Tensile: load 10 N; 10 s<br>Bending: load 5 N; $4 \times 90^\circ$   | No visible damage  |
| 4.4 Resistance to soldering heat                          | No pre-drying<br>Method: 1A<br>Solder bath: $280^\circ\text{C} \pm 5^\circ\text{C}$<br>Duration: 10 s  |  |
| <b>SUB-GROUP C1A PART OF SAMPLE OF SUB-GROUP C1</b>       |  |  |
| 4.19 Component solvent resistance                         | Isopropylalcohol at room temperature<br>Method: 2<br>Immersion time: 5 min $\pm$ 0.5 min<br>Recovery time: min. 1 h, max. 2 h  |  |
| 4.4.2 Final measurements                                  | Visual examination<br><br>Capacitance<br><br>Tangent of loss angle<br><br>Insulation resistance  | No visible damage<br>Legible marking<br><br>$ \Delta C/C  \leq 5\%$ of the value measured initially<br><br>Increase of $\tan \delta \leq 0.008$ for $\leq 1 \mu\text{F}$<br>Increase of $\tan \delta \leq 0.005$ for $C > 1 \mu\text{F}$<br>Compared to values measured initially<br><br>As specified in section "Insulation Resistance" of this specification |
| <b>SUB-GROUP C1B OTHER PART OF SAMPLE OF SUB-GROUP C1</b> |  |  |
| Initial measurements                                      | Capacitance<br>Tangent of loss angle at 10 kHz for $C \leq 1 \mu\text{F}$<br>Tangent of loss angle at 1 kHz for $C > 1 \mu\text{F}$  |  |
| 4.20 Solvent resistance of the marking                    | Isopropyl alcohol at room temperature<br>Method: 1<br>Rubbing material: cotton wool<br>Immersion time: 5 min $\pm$ 0.5 min   | No visible damage<br>Legible marking   |
| 4.6 Rapid change of temperature                           | $\theta A = -55^\circ\text{C}$<br>$\theta B = +110^\circ\text{C}$<br>5 cycles<br>Duration $t = 30$ min   |  |
| 4.6.1 Inspection  | Visual examination   | No visible damage  |
| 4.7 Vibration   | Mounting: see section "Mounting" of this specification<br>Procedure B4:<br>frequency range: 10 Hz to 55 Hz<br>Amplitude: 0.75 mm or<br>Acceleration $98 \text{ m/s}^2$<br>(whichever is less severe)<br>Total duration 6 h |  |
| 4.7.2 Final inspection                                    | Visual examination   | No visible damage  |



| <b>GROUP C INSPECTION REQUIREMENTS</b>                                      |   |  |
|---|---|--|
| <b>SUB-CLAUSE NUMBER AND TEST</b>   | <b>CONDITIONS</b>   | <b>PERFORMANCE REQUIREMENTS</b>  |
| 4.9 Shock   | Mounting: see section "Mounting" for more information<br>Pulse shape: half sine<br>Acceleration: 490 m/s <sup>2</sup><br>Duration of pulse: 11 ms         |  |
| 4.9.2 Final measurements  | Visual examination<br>Capacitance<br>Tangent of loss angle<br>Insulation resistance   | No visible damage<br>$ \Delta C/C  \leq 5\%$ of the value measured initially<br>Increase of $\tan \delta \leq 0.008$ for $\leq 1 \mu\text{F}$<br>Increase of $\tan \delta \leq 0.005$ for $C > 1 \mu\text{F}$<br>Compared to values measured initially<br>As specified in section "Insulation Resistance" of this specification  |
| <b>SUB-GROUP<br/>COMBINED SAMPLE OF SPECIMENS OF SUB-GROUPS C1A AND C1B</b> |   | <b>C1</b>  |
| 4.11 Climatic sequence  |   |  |
| 4.11.1 Initial measurements   | Capacitance<br>Measured in 4.4.2 and 4.9.2<br>Tangent of loss angle:<br>measured initially in C1A and C1B   |  |
| 4.11.2 Dry heat   | Temperature: 110 °C   |  |
| 4.11.3 Damp heat cyclic<br>Test Db<br>First cycle                           | Duration: 16 h  |  |
| 4.11.4 Cold   | Temperature: -55 °C   |  |
| 4.11.5 Damp heat cyclic<br>Test Db<br>remaining cycles                      | Duration: 2 h   |  |
| 4.11.6 Final measurements   | Visual examination<br>Capacitance<br>Tangent of loss angle<br>Voltage proof<br>1900 V <sub>DC</sub> ; 1 min between terminations<br>Insulation resistance | No visible damage<br>Legible marking<br>$ \Delta C/C  \leq 5\%$ of the value measured in 4.11.1.<br>Increase of $\tan \delta \leq 0.008$ for $\leq 1 \mu\text{F}$<br>Increase of $\tan \delta \leq 0.005$ for $C > 1 \mu\text{F}$<br>Compared to values measured in 4.11.1<br>No permanent breakdown or flash-over<br>$\geq 50\%$ of values specified in section "Insulation Resistance" of this specification |
| <b>SUB-GROUP C2</b>   |   |  |
| 4.12 Damp heat steady state   | 56 days, 40 °C, 90 % to 95 % RH,<br>no load   |  |
| 4.12.1 Initial measurements   | Capacitance<br>Tangent of loss angle at 1 kHz   |  |



| <b>GROUP C INSPECTION REQUIREMENTS</b> |   |  |
|--|---|--|
| <b>SUB-CLAUSE NUMBER AND TEST</b>      | <b>CONDITIONS</b>   | <b>PERFORMANCE REQUIREMENTS</b>  |
| 4.12.3 Final measurements              | Visual examination<br><br>Capacitance<br><br>Tangent of loss angle<br><br>Voltage proof<br>1900 V <sub>DC</sub> ; 1 min between terminations<br><br>Insulation resistance   | No visible damage<br>Legible marking<br><br>$ \Delta C/C  \leq 5\%$ of the value measured in 4.12.1.<br><br>Increase of $\tan \delta \leq 0.008$<br>Compared to values measured in 4.12.1.<br><br>No permanent breakdown or flash-over<br><br>$\geq 50\%$ of values specified in section<br>"Insulation Resistance" of this specification  |
| <b>SUB-GROUP C3</b>                    |   |  |
| 4.13.1 Initial measurements            | Capacitance<br>Tangent of loss angle at 10 kHz for $C \leq 1 \mu\text{F}$<br>Tangent of loss angle at 1 kHz for $C > 1 \mu\text{F}$   |  |
| 4.13 Impulse voltage                   | 3 successive impulses, full wave, peak voltage:<br>X1: 4.0 kV for $C \leq 1 \mu\text{F}$<br>X1: 4.0 kV/ $\sqrt{C}$ for $C > 1 \mu\text{F}$<br>Max. 24 pulses  | No self healing breakdowns or flash-over   |
| 4.14 Endurance                         | Duration: 1000 h<br>1.25 x U <sub>RAC</sub> at 110 °C<br>Once in every hour the voltage is increased to 1000 V <sub>RMS</sub> for 0.1 s via resistor of 47 Ω ± 5 %  |  |
| 4.14.7 Final measurements              | Visual examination<br><br>Capacitance<br><br>Tangent of loss angle<br><br>Voltage proof<br>1900 V <sub>DC</sub> ; 1 min between terminations<br>2160 V <sub>AC</sub> ; 1 min between terminations and case<br><br>Insulation resistance | No visible damage<br>Legible marking<br><br>$ \Delta C/C  \leq 10\%$ compared to values measured in 4.13.1.<br><br>Increase of $\tan \delta \leq 0.008$ for $\leq 1 \mu\text{F}$<br>Increase of $\tan \delta \leq 0.005$ for $C > 1 \mu\text{F}$<br>Compared to values measured in 4.13.1<br><br>No permanent breakdown or flash-over<br><br>$\geq 50\%$ of values specified in section<br>"Insulation Resistance" of this specification |
| <b>SUB-GROUP C4</b>                    |   |  |
| 4.15 Charge and discharge              | 10 000 cycles<br>charged to 465 V <sub>DC</sub><br>Discharge resistance:<br>$R_{\text{min.}} = 2.2 \Omega$ for pitch 37.5 mm and 52.5 mm<br>$R = \frac{465 V_{\text{DC}}}{1.5 \times C (dU/dt)}$  |  |
| 4.15.1 Initial measurements            | Capacitance<br>Tangent of loss angle at 10 kHz for $C \leq 1 \mu\text{F}$<br>Tangent of loss angle at 1 kHz for $C > 1 \mu\text{F}$   |  |

| <b>GROUP C INSPECTION REQUIREMENTS</b>   |   |   |
|--|---|---|
| <b>SUB-CLAUSE NUMBER AND TEST</b>  | <b>CONDITIONS</b>   | <b>PERFORMANCE REQUIREMENTS</b>   |
| 4.15.3 Final measurements  | Capacitance<br><br>Tangent of loss angle<br><br>Insulation resistance   | $ \Delta C/C  \leq 10\%$ compared to values measured in 4.15.1.<br><br>Increase of $\tan \delta \leq 0.008$ for $\leq 1 \mu\text{F}$<br>Increase of $\tan \delta \leq 0.005$ for $C > 1 \mu\text{F}$<br>Compared to values measured in 4.15.1<br><br>$\geq 50\%$ of values specified in section "Insulation Resistance" of this specification |
| <b>SUB-GROUP C5</b>  |   |   |
| 4.16 Radio frequency characteristic  | Resonance frequency   | $\geq 0.9$ times the value as specified in section "Resonant Frequency" of this specification   |
| <b>SUB-GROUP C6</b>  |   |   |
| 4.17 Passive flammability<br>Class B for volume $> 1750 \text{ mm}^3$<br>Class C for volume $\leq 1750 \text{ mm}^3$ | Bore of gas jet: $\varnothing 0.5 \text{ mm}$<br>Fuel: butane<br>Test duration for actual volume $V$ in $\text{mm}^3$ :<br>$V < 250$ : 5 s<br>Volume Class B Class C<br>$250 < V \leq 500$ : - 10 s<br>$500 < V \leq 1750$ : - 20 s<br>$V > 1750$ : 60 s -<br>One flame application<br><br> | After removing test flame from capacitor, the capacitor must not continue to burn for more than 10 s. No burning particle must drop from the sample.  |
| <b>SUB-GROUP C7</b>  |   |   |
| 4.18 Active flammability   | 20 cycles of 4 kV discharges on the test capacitor connected to $U_{\text{RAC}}$  | The cheese cloth around the capacitors shall not burn with a flame.<br>No electrical measurements are required.   |
| <b>SUB-GROUP ADD1</b>  |   |   |
| A.1 Damp heat steady state with voltage<br><br>A 1.1 Initial measurements<br><br>A 1.2 Final measurements            | RH: 40 %; temperature: 93 °C;<br>Voltage: 330 $V_{\text{AC}}$ , duration: 21 days<br>Capacitance<br><br>Tangent of loss angle: at 10 kHz<br><br>Visual examination<br><br>Capacitance<br><br>Tangent of loss angle<br><br>Insulation resistance   | No visible damage<br>Legible marking<br><br>$ \Delta C/C  \leq 10\%$ of the value with initial measurement A 1.1<br><br>Increase of $\tan \delta: \leq 0.024$ compared to values with initial measurement A 1.1<br><br>$\geq 50\%$ of values specified in section "Insulation Resistance" of this specification                               |



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