

# Interference Suppression Film Capacitors

## MKP Radial Potted Type



### FEATURES

- AEC-Q200 qualified (rev. C) up to 110 °C
- THB: 40 °C / 93 % RH for 1000 h at rated voltage, in compliance with AEC-Q200
- Compliant with IEC 60384-14: AMD1 grade IA
- High temperature capabilities, up to 125 °C
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

### APPLICATIONS

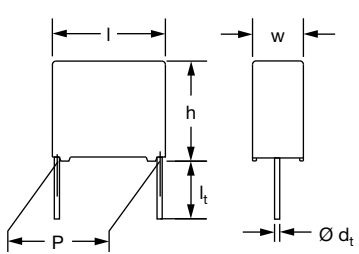
For standard across the line X2 applications.

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

| QUICK REFERENCE DATA                  |                                                                                                                                                                                                       |
|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rated capacitance range (E12 series)  | 0.001 µF to 4.7 µF (preferred values acc. to E6)                                                                                                                                                      |
| Capacitance tolerance                 | ± 20 %; ± 10 %; ± 5 %                                                                                                                                                                                 |
| Rated voltage range, U <sub>RAC</sub> | 310 V <sub>AC</sub> ; 50 Hz to 60 Hz                                                                                                                                                                  |
| Permissible DC voltage                | 800 V <sub>DC</sub> at 85 °C<br>630 V <sub>DC</sub> at 110 °C                                                                                                                                         |
| Climatic testing class                | 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 temperature                     | 110 °C                                                                                                                                                                                                |
| Maximum application temperature       | 125 °C for limited time                                                                                                                                                                               |
| Reference standards                   | IEC 60384-14:2013<br>IEC 60384-14:2013 / AMD1:2016<br>EN 60384-14:2013 + AMD1:2016<br>IEC 60065 requires pass. flamm. class B for volumes > 1750 mm <sup>3</sup><br>UL 60384-14<br>CSA-E384-14<br>CQC |
| Dielectric                            | Polypropylene film                                                                                                                                                                                    |
| Electrodes                            | Metallized                                                                                                                                                                                            |
| Construction                          | Mono construction                                                                                                                                                                                     |
| Encapsulation                         | Plastic case, epoxy resin sealed, flame retardant 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; manufacturer's logo;<br>year and week; safety approvals                    |

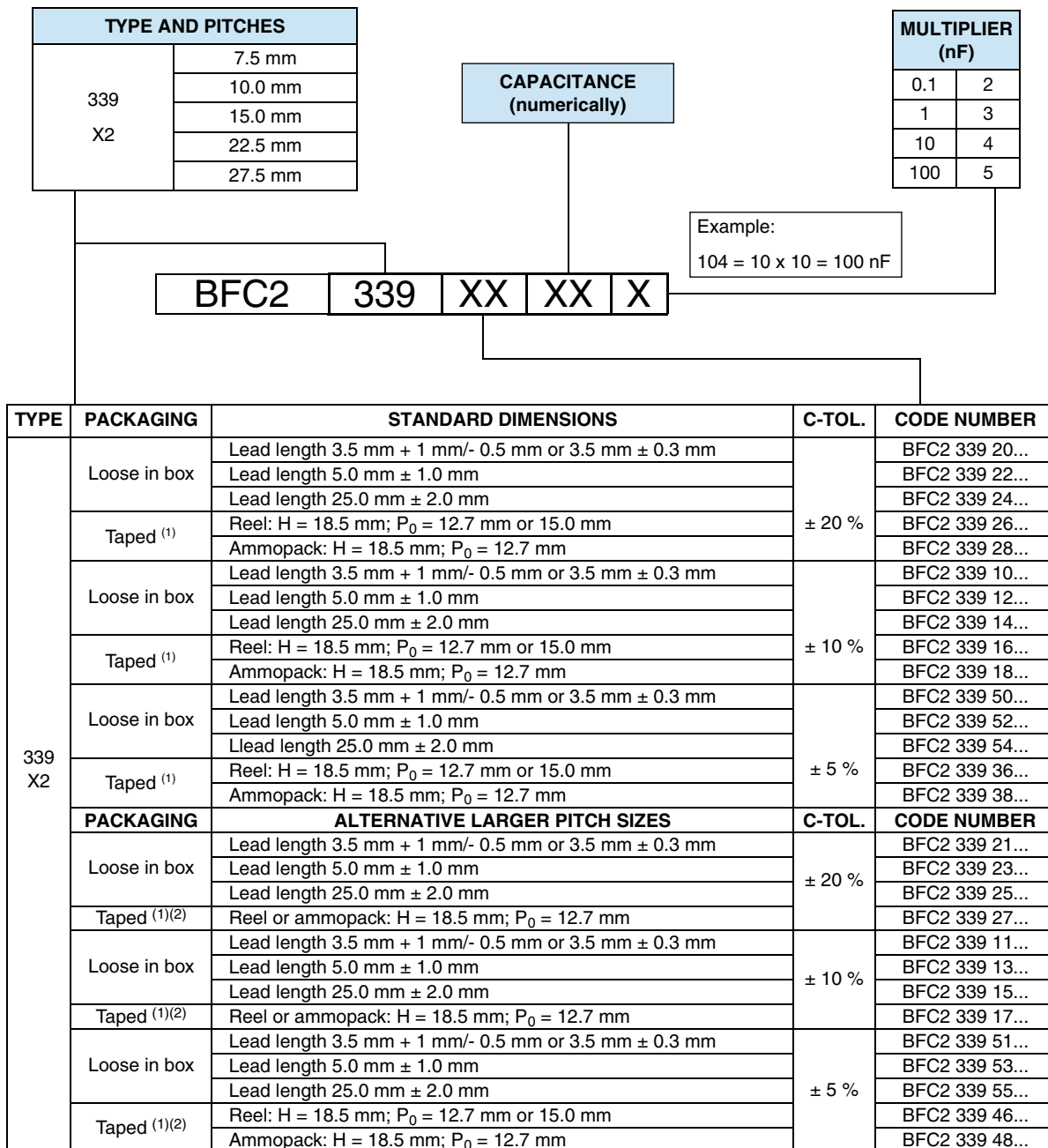
### Note

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

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



## COMPOSITION OF CATALOG NUMBER



## Notes

(1) For detailed tape specification refer to "Packaging Information": [www.vishay.com/doc?28139](http://www.vishay.com/doc?28139)

(2) Taped on reel pitch = 27.5 mm is not available



| SPECIFIC REFERENCE DATA                                                                                |                             |                          |
|--------------------------------------------------------------------------------------------------------|-----------------------------|--------------------------|
| DESCRIPTION                                                                                            | VALUE                       |                          |
| Rated AC voltage ( $U_{RAC}$ )                                                                         | 310 V                       |                          |
| Permissible DC voltage ( $U_{RDC}$ )                                                                   | 630 V                       |                          |
| Tangent of loss angle:                                                                                 | at 1 kHz                    | at 10 kHz                |
| $C < 470 \text{ nF}$                                                                                   | $\leq 10 \times 10^{-4}$    | $\leq 20 \times 10^{-4}$ |
| $470 \text{ nF} \leq C \leq 1 \text{ }\mu\text{F}$                                                     | $\leq 20 \times 10^{-4}$    | $\leq 70 \times 10^{-4}$ |
| $C > 1 \text{ }\mu\text{F}$                                                                            | $\leq 30 \times 10^{-4}$    | -                        |
| Rated voltage pulse slope ( $dU/dt$ ) <sub>R</sub> at 435 V <sub>DC</sub> :                            |                             |                          |
| Pitch = 7.5 mm                                                                                         | 600 V/ $\mu$ s              |                          |
| Pitch = 10 mm                                                                                          | 600 V/ $\mu$ s              |                          |
| Pitch = 15 mm                                                                                          | 400 V/ $\mu$ s              |                          |
| Pitch = 22.5 mm                                                                                        | 150 V/ $\mu$ s              |                          |
| Pitch = 27.5 mm                                                                                        | 100 V/ $\mu$ s              |                          |
| R between leads, for $C \leq 0.33 \text{ }\mu\text{F}$ at 100 V; 1 min                                 | $> 15\,000 \text{ M}\Omega$ |                          |
| RC between leads, for $C > 0.33 \text{ }\mu\text{F}$ at 100 V; 1 min                                   | $> 5000 \text{ s}$          |                          |
| R between leads and case; 100 V; 1 min                                                                 | $> 30\,000 \text{ M}\Omega$ |                          |
| Withstanding (DC) voltage (cut off current 10 mA) <sup>(1)</sup> ; rise time $\leq 1000 \text{ V/s}$ : |                             |                          |
| $C \leq 1 \text{ }\mu\text{F}$                                                                         | 2200 V; 1 min               |                          |
| $C > 1 \text{ }\mu\text{F}$                                                                            | 1800 V; 1 min               |                          |
| Withstanding (AC) voltage between leads and case                                                       | 2120 V; 1 min               |                          |
| Max. application temperature for $0.001 \text{ }\mu\text{F} \leq C \leq 0.47 \text{ }\mu\text{F}$      | 125 °C up to 1000 h         |                          |
| Max. application temperature for $C > 0.47 \text{ }\mu\text{F}$                                        | 125 °C up to 500 h          |                          |

**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 - PITCH: 7.5 mm |                                                                              |                                                |                            |                                             |                                     |      |                                      |      |                                         |      |
|----------------------------------------------------------|------------------------------------------------------------------------------|------------------------------------------------|----------------------------|---------------------------------------------|-------------------------------------|------|--------------------------------------|------|-----------------------------------------|------|
| U <sub>RAC</sub><br>(V)                                  | CAP.<br>(μF)                                                                 | DIMENSIONS <sup>(1)</sup><br>w x h x l<br>(mm) | MASS<br>(g) <sup>(2)</sup> | CATALOG NUMBER BFC2 339 XXXXX AND PACKAGING |                                     |      |                                      |      |                                         |      |
|                                                          |                                                                              |                                                |                            | LOOSE IN BOX                                |                                     |      |                                      |      | AMMOPACK <sup>(3)</sup>                 |      |
|                                                          |                                                                              |                                                |                            | SHORT LEADS                                 |                                     |      | LONG LEADS                           |      | H = 18.5 mm<br>P <sub>0</sub> = 12.7 mm |      |
|                                                          |                                                                              |                                                |                            | I <sub>t</sub> = 3.5 mm<br>+ 1 mm/- 0.5 mm  | I <sub>t</sub> = 5.0 mm<br>± 1.0 mm | SPQ  | I <sub>t</sub> = 25.0 mm<br>± 2.0 mm | SPQ  |                                         | SPQ  |
| 310                                                      | PITCH = 7.5 mm ± 0.4 mm; d <sub>t</sub> = 0.50 mm ± 0.05 mm; C-TOL. = ± 20 % |                                                |                            |                                             |                                     |      |                                      |      |                                         |      |
|                                                          | 0.0010                                                                       | 4.0 x 9.0 x 10.0                               | 0.4                        | 20102                                       | 22102                               | 1500 | 24102                                | 1000 | 28102                                   | 1250 |
|                                                          | 0.0015                                                                       |                                                |                            | 20152                                       | 22152                               |      | 24152                                |      | 28152                                   |      |
|                                                          | 0.0022                                                                       |                                                |                            | 20222                                       | 22222                               |      | 24222                                |      | 28222                                   |      |
|                                                          | 0.0033                                                                       |                                                |                            | 20332                                       | 22332                               |      | 24332                                |      | 28332                                   |      |
|                                                          | 0.0047                                                                       |                                                |                            | 20472                                       | 22472                               |      | 24472                                |      | 28472                                   |      |
|                                                          | 0.0068                                                                       |                                                |                            | 20682                                       | 22682                               |      | 24682                                |      | 28682                                   |      |
|                                                          | 0.010                                                                        |                                                |                            | 20103                                       | 22103                               |      | 24103                                |      | 28103                                   |      |
|                                                          | 0.015                                                                        |                                                |                            | 20153                                       | 22153                               |      | 24153                                |      | 28153                                   |      |
|                                                          | 0.022                                                                        |                                                |                            | 20223                                       | 22223                               |      | 24223                                |      | 28223                                   |      |
|                                                          | 0.033                                                                        |                                                |                            | 20333                                       | 22333                               |      | 24333                                |      | 28333                                   |      |
|                                                          | 0.047                                                                        | 5.0 x 10.5 x 10.0                              | 0.4                        | 20473                                       | 22473                               | 1000 | 24473                                | 1250 | 28473                                   | 1000 |
|                                                          | 0.068                                                                        | 6.0 x 11.5 x 10.0                              | 0.8                        | 20683                                       | 22683                               | 750  | 24683                                | 1000 | 28683                                   | 750  |



| ELECTRICAL DATA AND ORDERING INFORMATION - PITCH: 7.5 mm |                                                                              |                                                |                            |                                             |                                     |      |                                      |      |                                         |      |
|----------------------------------------------------------|------------------------------------------------------------------------------|------------------------------------------------|----------------------------|---------------------------------------------|-------------------------------------|------|--------------------------------------|------|-----------------------------------------|------|
| U <sub>RAC</sub><br>(V)                                  | CAP.<br>(μF)                                                                 | DIMENSIONS <sup>(1)</sup><br>w x h x l<br>(mm) | MASS<br>(g) <sup>(2)</sup> | CATALOG NUMBER BFC2 339 XXXXX AND PACKAGING |                                     |      |                                      |      |                                         |      |
|                                                          |                                                                              |                                                |                            | LOOSE IN BOX                                |                                     |      |                                      |      | AMMOPACK <sup>(3)</sup>                 |      |
|                                                          |                                                                              |                                                |                            | SHORT LEADS                                 |                                     |      | LONG LEADS                           |      | H = 18.5 mm<br>P <sub>0</sub> = 12.7 mm |      |
|                                                          |                                                                              |                                                |                            | I <sub>t</sub> = 3.5 mm<br>+ 1 mm/- 0.5 mm  | I <sub>t</sub> = 5.0 mm<br>± 1.0 mm | SPQ  | I <sub>t</sub> = 25.0 mm<br>± 2.0 mm | SPQ  |                                         | SPQ  |
| 310                                                      | PITCH = 7.5 mm ± 0.4 mm; d <sub>t</sub> = 0.50 mm ± 0.05 mm; C-TOL. = ± 10 % |                                                |                            |                                             |                                     |      |                                      |      |                                         |      |
|                                                          | 0.0010                                                                       | 4.0 x 9.0 x 10.0                               | 0.45                       | 10102                                       | 12102                               | 1500 | 14102                                | 1000 | 18102                                   | 1250 |
|                                                          | 0.0012                                                                       |                                                |                            | 10122                                       | 12122                               |      | 14122                                |      | 18122                                   |      |
|                                                          | 0.0015                                                                       |                                                |                            | 10152                                       | 12152                               |      | 14152                                |      | 18152                                   |      |
|                                                          | 0.0018                                                                       |                                                |                            | 10182                                       | 12182                               |      | 14182                                |      | 18182                                   |      |
|                                                          | 0.0022                                                                       |                                                |                            | 10222                                       | 12222                               |      | 14222                                |      | 18222                                   |      |
|                                                          | 0.0027                                                                       |                                                |                            | 10272                                       | 12272                               |      | 14272                                |      | 18272                                   |      |
|                                                          | 0.0033                                                                       |                                                |                            | 10332                                       | 12332                               |      | 14332                                |      | 18332                                   |      |
|                                                          | 0.0039                                                                       |                                                |                            | 10392                                       | 12392                               |      | 14392                                |      | 18392                                   |      |
|                                                          | 0.0047                                                                       |                                                |                            | 10472                                       | 12472                               |      | 14472                                |      | 18472                                   |      |
|                                                          | 0.0056                                                                       |                                                |                            | 10562                                       | 12562                               |      | 14562                                |      | 18562                                   |      |
|                                                          | 0.0068                                                                       |                                                |                            | 10682                                       | 12682                               |      | 14682                                |      | 18682                                   |      |
|                                                          | 0.0082                                                                       |                                                |                            | 10822                                       | 12822                               |      | 14822                                |      | 18822                                   |      |
|                                                          | 0.010                                                                        |                                                |                            | 10103                                       | 12103                               |      | 14103                                |      | 18103                                   |      |
|                                                          | 0.012                                                                        |                                                |                            | 10123                                       | 12123                               |      | 14123                                |      | 18123                                   |      |
|                                                          | 0.015                                                                        |                                                |                            | 10153                                       | 12153                               |      | 14153                                |      | 18153                                   |      |
|                                                          | 0.018                                                                        |                                                |                            | 10183                                       | 12183                               |      | 14183                                |      | 18183                                   |      |
|                                                          | 0.022                                                                        |                                                |                            | 10223                                       | 12223                               |      | 14223                                |      | 18223                                   |      |
|                                                          | 0.027                                                                        |                                                |                            | 10273                                       | 12273                               |      | 14273                                |      | 18273                                   |      |
|                                                          | 0.033                                                                        | 5.0 x 10.5 x 10.0                              | 0.6                        | 10333                                       | 12333                               | 1000 | 14333                                | 1250 | 18333                                   | 1000 |
|                                                          | 0.039                                                                        |                                                |                            | 10393                                       | 12393                               |      | 14393                                |      | 18393                                   |      |
|                                                          | 0.047                                                                        |                                                |                            | 10473                                       | 12473                               |      | 14473                                |      | 18473                                   |      |
|                                                          | 0.056                                                                        | 6.0 x 11.5 x 10.0                              | 0.8                        | 10563                                       | 12563                               | 750  | 14563                                | 1000 | 18563                                   | 750  |
|                                                          | PITCH = 7.5 mm ± 0.4 mm; d <sub>t</sub> = 0.50 mm ± 0.05 mm; C-TOL. = ± 5 %  |                                                |                            |                                             |                                     |      |                                      |      |                                         |      |
|                                                          | 0.0010                                                                       | 4.0 x 9.0 x 10.0                               | 0.45                       | 50102                                       | 52102                               | 1500 | 54102                                | 1000 | 38102                                   | 1250 |
|                                                          | 0.0012                                                                       |                                                |                            | 50122                                       | 52122                               |      | 54122                                |      | 38122                                   |      |
|                                                          | 0.0015                                                                       |                                                |                            | 50152                                       | 52152                               |      | 54152                                |      | 38152                                   |      |
|                                                          | 0.0018                                                                       |                                                |                            | 50182                                       | 52182                               |      | 54182                                |      | 38182                                   |      |
|                                                          | 0.0022                                                                       |                                                |                            | 50222                                       | 52222                               |      | 54222                                |      | 38222                                   |      |
|                                                          | 0.0027                                                                       |                                                |                            | 50272                                       | 52272                               |      | 54272                                |      | 38272                                   |      |
|                                                          | 0.0033                                                                       |                                                |                            | 50332                                       | 52332                               |      | 54332                                |      | 38332                                   |      |
|                                                          | 0.0039                                                                       |                                                |                            | 50392                                       | 52392                               |      | 54392                                |      | 38392                                   |      |
|                                                          | 0.0047                                                                       |                                                |                            | 50472                                       | 52472                               |      | 54472                                |      | 38472                                   |      |
|                                                          | 0.0056                                                                       |                                                |                            | 50562                                       | 52562                               |      | 54562                                |      | 38562                                   |      |
|                                                          | 0.0068                                                                       |                                                |                            | 50682                                       | 52682                               |      | 54682                                |      | 38682                                   |      |
|                                                          | 0.0082                                                                       |                                                |                            | 50822                                       | 52822                               |      | 54822                                |      | 38822                                   |      |
|                                                          | 0.010                                                                        |                                                |                            | 50103                                       | 52103                               |      | 54103                                |      | 38103                                   |      |
|                                                          | 0.012                                                                        |                                                |                            | 50123                                       | 52123                               |      | 54123                                |      | 38123                                   |      |
|                                                          | 0.015                                                                        |                                                |                            | 50153                                       | 52153                               |      | 54153                                |      | 38153                                   |      |
|                                                          | 0.018                                                                        |                                                |                            | 50183                                       | 52183                               |      | 54183                                |      | 38183                                   |      |
|                                                          | 0.022                                                                        |                                                |                            | 50223                                       | 52223                               |      | 54223                                |      | 38223                                   |      |
|                                                          | 0.027                                                                        |                                                |                            | 50273                                       | 52273                               |      | 54273                                |      | 38273                                   |      |
|                                                          | 0.033                                                                        | 5.0 x 10.5 x 10.0                              | 0.6                        | 50333                                       | 52333                               | 1000 | 54333                                | 1250 | 38333                                   | 1000 |
|                                                          | 0.039                                                                        |                                                |                            | 50393                                       | 52393                               |      | 54393                                |      | 38393                                   |      |
|                                                          | 0.047                                                                        | 6.0 x 11.5 x 10.0                              | 0.8                        | 50473                                       | 52473                               | 750  | 54473                                | 1000 | 38473                                   | 750  |
|                                                          | 0.056                                                                        |                                                |                            | 50563                                       | 52563                               |      | 54563                                |      | 38563                                   |      |

## Notes

- SPQ = Standard Packing Quantity
- (1) For tolerances see section "Space Requirements for Printed-Circuit Board Applications and Dimension Tolerances"
- (2) Weight for short lead product only
- (3) H = in-tape height; P<sub>0</sub> = sprocket hole distance; for detailed specifications refer to packaging information



| ELECTRICAL DATA AND ORDERING INFORMATION - PITCH: 10 mm |                                                                               |                                                |                            |                                             |                                     |      |                                      |      |                                         |     |                                          |     |
|---------------------------------------------------------|-------------------------------------------------------------------------------|------------------------------------------------|----------------------------|---------------------------------------------|-------------------------------------|------|--------------------------------------|------|-----------------------------------------|-----|------------------------------------------|-----|
| U <sub>RAC</sub><br>(V)                                 | CAP.<br>(μF)                                                                  | DIMENSIONS <sup>(1)</sup><br>w x h x l<br>(mm) | MASS<br>(g) <sup>(2)</sup> | CATALOG NUMBER BFC2 339 XXXXX AND PACKAGING |                                     |      |                                      |      |                                         |     |                                          |     |
|                                                         |                                                                               |                                                |                            | LOOSE IN BOX                                |                                     |      |                                      |      | AMMOPACK <sup>(3)</sup>                 |     | LARGE REEL<br>(500 mm) <sup>(3)(4)</sup> |     |
|                                                         |                                                                               |                                                |                            | SHORT LEADS                                 |                                     |      | LONG LEADS                           |      | H = 18.5 mm<br>P <sub>0</sub> = 12.7 mm |     | H = 18.5 mm<br>P <sub>0</sub> = 12.7 mm  |     |
|                                                         |                                                                               |                                                |                            | l <sub>t</sub> = 3.5 mm<br>+ 1 mm/- 0.5 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  |                                         | SPQ |                                          | SPQ |
| 310                                                     | PITCH = 10.0 mm ± 0.4 mm; d <sub>t</sub> = 0.60 mm ± 0.06 mm; C-TOL. = ± 20 % |                                                |                            |                                             |                                     |      |                                      |      |                                         |     |                                          |     |
|                                                         | 0.0010                                                                        | 4.0 x 10.0 x 12.5                              | 0.6                        | 21102                                       | 23102                               | 1000 | 25102                                | 1250 | 27102                                   | 950 | -                                        | -   |
|                                                         | 0.0015                                                                        |                                                |                            | 21152                                       | 23152                               |      | 25152                                |      | 27152                                   |     |                                          |     |
|                                                         | 0.0022                                                                        |                                                |                            | 21222                                       | 23222                               |      | 25222                                |      | 27222                                   |     |                                          |     |
|                                                         | 0.0033                                                                        |                                                |                            | 21332                                       | 23332                               |      | 25332                                |      | 27332                                   |     |                                          |     |
|                                                         | 0.0047                                                                        |                                                |                            | 21472                                       | 23472                               |      | 25472                                |      | 27472                                   |     |                                          |     |
|                                                         | 0.0068                                                                        |                                                |                            | 21682                                       | 23682                               |      | 25682                                |      | 27682                                   |     |                                          |     |
|                                                         | 0.010                                                                         |                                                |                            | 21103                                       | 23103                               |      | 25103                                |      | 27103                                   |     |                                          |     |
|                                                         | 0.015                                                                         |                                                |                            | 21153                                       | 23153                               |      | 25153                                |      | 27153                                   |     |                                          |     |
|                                                         | 0.022                                                                         |                                                |                            | 21223                                       | 23223                               |      | 25223                                |      | 27223                                   |     |                                          |     |
|                                                         | 0.033                                                                         |                                                |                            | 21333                                       | 23333                               |      | 25333                                |      | 27333                                   |     |                                          |     |
|                                                         | 0.047                                                                         |                                                |                            | 21473                                       | 23473                               |      | 25473                                |      | 27473                                   |     |                                          |     |
|                                                         | 0.068                                                                         | 5.0 x 11.0 x 12.5                              | 0.82                       | 21683                                       | 23683                               | 1000 | 25683                                | 1000 | 27683                                   | 750 | -                                        | -   |
|                                                         | 0.100                                                                         | 6.0 x 12.0 x 12.5                              | 1.1                        | 20104                                       | 22104                               | 750  | 24104                                | 750  | 28104                                   | 600 | 26104                                    | 900 |
|                                                         | PITCH = 10.0 mm ± 0.4 mm; d <sub>t</sub> = 0.60 mm ± 0.06 mm; C-TOL. = ± 10 % |                                                |                            |                                             |                                     |      |                                      |      |                                         |     |                                          |     |
|                                                         | 0.0010                                                                        | 4.0 x 10.0 x 12.5                              | 0.6                        | 11102                                       | 13102                               | 1000 | 15102                                | 1250 | 17102                                   | 950 | -                                        | -   |
|                                                         | 0.0012                                                                        |                                                |                            | 11122                                       | 13122                               |      | 15122                                |      | 17122                                   |     |                                          |     |
|                                                         | 0.0015                                                                        |                                                |                            | 11152                                       | 13152                               |      | 15152                                |      | 17152                                   |     |                                          |     |
|                                                         | 0.0018                                                                        |                                                |                            | 11182                                       | 13182                               |      | 15182                                |      | 17182                                   |     |                                          |     |
|                                                         | 0.0022                                                                        |                                                |                            | 11222                                       | 13222                               |      | 15222                                |      | 17222                                   |     |                                          |     |
|                                                         | 0.0027                                                                        |                                                |                            | 11272                                       | 13272                               |      | 15272                                |      | 17272                                   |     |                                          |     |
|                                                         | 0.0033                                                                        |                                                |                            | 11332                                       | 13332                               |      | 15332                                |      | 17332                                   |     |                                          |     |
|                                                         | 0.0039                                                                        |                                                |                            | 11392                                       | 13392                               |      | 15392                                |      | 17392                                   |     |                                          |     |
|                                                         | 0.0047                                                                        |                                                |                            | 11472                                       | 13472                               |      | 15472                                |      | 17472                                   |     |                                          |     |
|                                                         | 0.0056                                                                        |                                                |                            | 11562                                       | 13562                               |      | 15562                                |      | 17562                                   |     |                                          |     |
|                                                         | 0.0068                                                                        |                                                |                            | 11682                                       | 13682                               |      | 15682                                |      | 17682                                   |     |                                          |     |
|                                                         | 0.0082                                                                        |                                                |                            | 11822                                       | 13822                               |      | 15822                                |      | 17822                                   |     |                                          |     |
|                                                         | 0.010                                                                         |                                                |                            | 11103                                       | 13103                               |      | 15103                                |      | 17103                                   |     |                                          |     |
|                                                         | 0.012                                                                         |                                                |                            | 11123                                       | 13123                               |      | 15123                                |      | 17123                                   |     |                                          |     |
|                                                         | 0.015                                                                         |                                                |                            | 11153                                       | 13153                               |      | 15153                                |      | 17153                                   |     |                                          |     |
|                                                         | 0.018                                                                         |                                                |                            | 11183                                       | 13183                               |      | 15183                                |      | 17183                                   |     |                                          |     |
|                                                         | 0.022                                                                         |                                                |                            | 11223                                       | 13223                               |      | 15223                                |      | 17223                                   |     |                                          |     |
|                                                         | 0.027                                                                         |                                                |                            | 11273                                       | 13273                               |      | 15273                                |      | 17273                                   |     |                                          |     |
|                                                         | 0.033                                                                         |                                                |                            | 11333                                       | 13333                               |      | 15333                                |      | 17333                                   |     |                                          |     |
|                                                         | 0.039                                                                         |                                                |                            | 11393                                       | 13393                               |      | 15393                                |      | 17393                                   |     |                                          |     |
|                                                         | 0.047                                                                         |                                                |                            | 11473                                       | 13473                               |      | 15473                                |      | 17473                                   |     |                                          |     |
|                                                         | 0.056                                                                         | 5.0 x 11.0 x 12.5                              | 0.82                       | 11563                                       | 13563                               | 1000 | 15563                                | 1000 | 17563                                   | 750 | -                                        | -   |
|                                                         | 0.068                                                                         |                                                |                            | 10683                                       | 12683                               |      | 14683                                |      | 18683                                   |     |                                          |     |
|                                                         | 0.082                                                                         | 6.0 x 12.0 x 12.5                              | 1.1                        | 10823                                       | 12823                               | 750  | 14823                                | 750  | 18823                                   | 600 | 16823                                    | 900 |
|                                                         | 0.100                                                                         |                                                |                            | 10104                                       | 12104                               |      | 14104                                |      | 18104                                   |     |                                          |     |



| ELECTRICAL DATA AND ORDERING INFORMATION - PITCH: 10 mm |                                                                              |                                                |                            |                                             |                                     |       |                                      |       |                                         |       |                                          |       |
|---------------------------------------------------------|------------------------------------------------------------------------------|------------------------------------------------|----------------------------|---------------------------------------------|-------------------------------------|-------|--------------------------------------|-------|-----------------------------------------|-------|------------------------------------------|-------|
| U <sub>RAC</sub><br>(V)                                 | CAP.<br>(μF)                                                                 | DIMENSIONS <sup>(1)</sup><br>w x h x l<br>(mm) | MASS<br>(g) <sup>(2)</sup> | CATALOG NUMBER BFC2 339 XXXXX AND PACKAGING |                                     |       |                                      |       |                                         |       |                                          |       |
|                                                         |                                                                              |                                                |                            | LOOSE IN BOX                                |                                     |       |                                      |       | AMMOPACK <sup>(3)</sup>                 |       | LARGE REEL<br>(500 mm) <sup>(3)(4)</sup> |       |
|                                                         |                                                                              |                                                |                            | SHORT LEADS                                 |                                     |       | LONG LEADS                           |       | H = 18.5 mm<br>P <sub>0</sub> = 12.7 mm |       | H = 18.5 mm<br>P <sub>0</sub> = 12.7 mm  |       |
|                                                         |                                                                              |                                                |                            | l <sub>t</sub> = 3.5 mm<br>+ 1 mm/- 0.5 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   |                                         | SPQ   |                                          | SPQ   |
|                                                         | PITCH = 10.0 mm ± 0.4 mm; d <sub>t</sub> = 0.60 mm ± 0.06 mm; C-TOL. = ± 5 % |                                                |                            |                                             |                                     |       |                                      |       |                                         |       |                                          |       |
| 310                                                     | 0.0010                                                                       | 4.0 x 10.0 x 12.5                              | 0.6                        | 51102                                       | 53102                               | 1000  | 55102                                | 1250  | 48102                                   | 950   | -                                        | -     |
|                                                         | 0.0012                                                                       |                                                |                            | 51122                                       | 53122                               |       | 55122                                |       | 48122                                   |       |                                          |       |
|                                                         | 0.0015                                                                       |                                                |                            | 51152                                       | 53152                               |       | 55152                                |       | 48152                                   |       |                                          |       |
|                                                         | 0.0018                                                                       |                                                |                            | 51182                                       | 53182                               |       | 55182                                |       | 48182                                   |       |                                          |       |
|                                                         | 0.0022                                                                       |                                                |                            | 51222                                       | 53222                               |       | 55222                                |       | 48222                                   |       |                                          |       |
|                                                         | 0.0027                                                                       |                                                |                            | 51272                                       | 53272                               |       | 55272                                |       | 48272                                   |       |                                          |       |
|                                                         | 0.0033                                                                       |                                                |                            | 51332                                       | 53332                               |       | 55332                                |       | 48332                                   |       |                                          |       |
|                                                         | 0.0039                                                                       |                                                |                            | 51392                                       | 53392                               |       | 55392                                |       | 48392                                   |       |                                          |       |
|                                                         | 0.0047                                                                       |                                                |                            | 51472                                       | 53472                               |       | 55472                                |       | 48472                                   |       |                                          |       |
|                                                         | 0.0056                                                                       |                                                |                            | 51562                                       | 53562                               |       | 55562                                |       | 48562                                   |       |                                          |       |
|                                                         | 0.0068                                                                       |                                                |                            | 51682                                       | 53682                               |       | 55682                                |       | 48682                                   |       |                                          |       |
|                                                         | 0.0082                                                                       |                                                |                            | 51822                                       | 53822                               |       | 55822                                |       | 48822                                   |       |                                          |       |
|                                                         | 0.010                                                                        |                                                |                            | 51103                                       | 53103                               |       | 55103                                |       | 48103                                   |       |                                          |       |
|                                                         | 0.012                                                                        |                                                |                            | 51123                                       | 53123                               |       | 55123                                |       | 48123                                   |       |                                          |       |
|                                                         | 0.015                                                                        |                                                |                            | 51153                                       | 53153                               |       | 55153                                |       | 48153                                   |       |                                          |       |
|                                                         | 0.018                                                                        |                                                |                            | 51183                                       | 53183                               |       | 55183                                |       | 48183                                   |       |                                          |       |
|                                                         | 0.022                                                                        |                                                |                            | 51223                                       | 53223                               |       | 55223                                |       | 48223                                   |       |                                          |       |
|                                                         | 0.027                                                                        |                                                |                            | 51273                                       | 53273                               |       | 55273                                |       | 48273                                   |       |                                          |       |
|                                                         | 0.033                                                                        |                                                |                            | 51333                                       | 53333                               |       | 55333                                |       | 48333                                   |       |                                          |       |
|                                                         | 0.039                                                                        |                                                |                            | 51393                                       | 53393                               |       | 55393                                |       | 48393                                   |       |                                          |       |
|                                                         | 0.047                                                                        | 51473                                          | 53473                      | 55473                                       | 48473                               |       |                                      |       |                                         |       |                                          |       |
|                                                         | 0.056                                                                        | 5.0 x 11.0 x 12.5                              | 0.82                       | 51563                                       | 53563                               | 1000  | 55563                                | 1000  | 48563                                   | 750   | 46563                                    | 1100  |
|                                                         | 0.068                                                                        |                                                |                            | 50683                                       | 52683                               |       | 54683                                |       | 38683                                   |       | 36683                                    |       |
|                                                         |                                                                              | 0.082                                          | 6.0 x 12.0 x 12.5          | 1.1                                         | 50823                               | 52823 | 750                                  | 54823 | 750                                     | 38823 | 600                                      | 36823 |

**Notes**

- SPQ = Standard Packing Quantity
- <sup>(1)</sup> For tolerances see section "Space Requirements for Printed-Circuit Board Applications and Dimension Tolerances"
- <sup>(2)</sup> Weight for short lead product only
- <sup>(3)</sup> H = in-tape height; P<sub>0</sub> = sprocket hole distance; for detailed specifications refer to packaging information
- <sup>(4)</sup> Reel diameter = 356 mm is available on request



| ELECTRICAL DATA AND ORDERING INFORMATION - PITCH: 15 mm |                                                                             |                                                |                            |                                             |                                     |      |                                      |      |                                          |      |
|---------------------------------------------------------|-----------------------------------------------------------------------------|------------------------------------------------|----------------------------|---------------------------------------------|-------------------------------------|------|--------------------------------------|------|------------------------------------------|------|
| U <sub>RAC</sub><br>(V)                                 | CAP.<br>(μF)                                                                | DIMENSIONS <sup>(1)</sup><br>w x h x l<br>(mm) | MASS<br>(g) <sup>(2)</sup> | CATALOG NUMBER BFC2 339 XXXXX AND PACKAGING |                                     |      |                                      |      |                                          |      |
|                                                         |                                                                             |                                                |                            | LOOSE IN BOX                                |                                     |      |                                      |      | LARGE REEL<br>(500 mm) <sup>(3)(4)</sup> |      |
|                                                         |                                                                             |                                                |                            | SHORT LEADS                                 |                                     |      | LONG LEADS                           |      | H = 18.5 mm<br>P <sub>0</sub> = 12.7 mm  |      |
|                                                         |                                                                             |                                                |                            | l <sub>t</sub> = 3.5 mm<br>± 0.3 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  |                                          | SPQ  |
| 310                                                     | PITCH = 15 mm ± 0.4 mm; d <sub>t</sub> = 0.60 mm ± 0.06 mm; C-TOL. = ± 20 % |                                                |                            |                                             |                                     |      |                                      |      |                                          |      |
|                                                         | 0.010                                                                       | 5.0 x 11.0 x 17.5                              | 1                          | 90001                                       | 90007                               | 1250 | 90014                                | 1000 | 90021                                    | 1100 |
|                                                         | 0.015                                                                       |                                                |                            | 90002                                       | 90008                               |      | 90015                                |      | 90022                                    |      |
|                                                         | 0.022                                                                       |                                                |                            | 90003                                       | 90009                               |      | 90016                                |      | 90023                                    |      |
|                                                         | 0.033                                                                       |                                                |                            | 90004                                       | 90011                               |      | 90017                                |      | 90024                                    |      |
|                                                         | 0.047                                                                       |                                                |                            | 90005                                       | 90012                               |      | 90018                                |      | 90025                                    |      |
|                                                         | 0.068                                                                       |                                                |                            | 90006                                       | 90013                               |      | 90019                                |      | 90026                                    |      |
|                                                         | 0.10                                                                        |                                                |                            | 21104                                       | 23104                               |      | 25104                                |      | 27104                                    |      |
|                                                         | 0.15                                                                        | 6.0 x 12.0 x 17.5                              | 1.4                        | 20154                                       | 22154                               | 1000 | 24154                                | 1000 | 26154                                    | 900  |
|                                                         | PITCH = 15 mm ± 0.4 mm; d <sub>t</sub> = 0.80 mm ± 0.08 mm; C-TOL. = ± 20 % |                                                |                            |                                             |                                     |      |                                      |      |                                          |      |
|                                                         | 0.22                                                                        | 7.0 x 13.5 x 17.5                              | 1.8                        | 20224                                       | 22224                               | 750  | 24224                                | 500  | 26224                                    | 800  |
|                                                         | 0.33                                                                        | 8.5 x 15.0 x 17.5                              | 2.4                        | 20334                                       | 22334                               | 750  | 24334                                | 500  | 26334                                    | 650  |
|                                                         | 0.47                                                                        | 10.0 x 16.5 x 17.5                             | 3.0                        | 20474                                       | 22474                               | 500  | 24474                                | 450  | 26474                                    | 600  |
|                                                         |                                                                             | 8.5 x 17.5 x 18.0                              | 3.1                        | 90165                                       | 90166                               | 300  | 90143                                | 500  | -                                        | -    |
|                                                         | 0.56                                                                        | 11.0 x 18.5 x 18.0                             | 4.3                        | 90174                                       | 90175                               | 225  | 90176                                | 350  | -                                        | -    |
|                                                         | 0.68                                                                        | 11.0 x 18.5 x 18.0                             | 5.5                        | 90168                                       | 90169                               | 225  | 90145                                | 350  | -                                        | -    |
|                                                         | PITCH = 15 mm ± 0.4 mm; d <sub>t</sub> = 0.60 mm ± 0.06 mm; C-TOL. = ± 10 % |                                                |                            |                                             |                                     |      |                                      |      |                                          |      |
|                                                         | 0.010                                                                       | 5.0 x 11.0 x 17.5                              | 1.0                        | 90027                                       | 90039                               | 1250 | 90052                                | 1000 | 90064                                    | 1100 |
|                                                         | 0.012                                                                       |                                                |                            | 90028                                       | 90041                               |      | 90053                                |      | 90065                                    |      |
|                                                         | 0.015                                                                       |                                                |                            | 90029                                       | 90042                               |      | 90054                                |      | 90066                                    |      |
|                                                         | 0.018                                                                       |                                                |                            | 90031                                       | 90043                               |      | 90055                                |      | 90067                                    |      |
|                                                         | 0.022                                                                       |                                                |                            | 90032                                       | 90044                               |      | 90056                                |      | 90068                                    |      |
|                                                         | 0.027                                                                       |                                                |                            | 90033                                       | 90045                               |      | 90057                                |      | 90069                                    |      |
|                                                         | 0.033                                                                       |                                                |                            | 90034                                       | 90046                               |      | 90058                                |      | 90071                                    |      |
|                                                         | 0.039                                                                       |                                                |                            | 90035                                       | 90047                               |      | 90059                                |      | 90072                                    |      |
|                                                         | 0.047                                                                       |                                                |                            | 90036                                       | 90048                               |      | 90061                                |      | 90073                                    |      |
|                                                         | 0.056                                                                       |                                                |                            | 90037                                       | 90049                               |      | 90062                                |      | 90074                                    |      |
|                                                         | 0.068                                                                       |                                                |                            | 11683                                       | 13683                               |      | 15683                                |      | 17683                                    |      |
|                                                         | 0.082                                                                       |                                                |                            | 11823                                       | 13823                               |      | 15823                                |      | 17823                                    |      |
|                                                         | 0.100                                                                       |                                                |                            | 11104                                       | 13104                               |      | 15104                                |      | 17104                                    |      |
|                                                         | 0.12                                                                        | 6.0 x 12.0 x 17.5                              | 1.4                        | 10124                                       | 12124                               | 1000 | 14124                                | 1000 | 16124                                    | 900  |
|                                                         | 0.15                                                                        |                                                |                            | 10154                                       | 12154                               |      | 14154                                |      | 16154                                    |      |
|                                                         | PITCH = 15 mm ± 0.4 mm; d <sub>t</sub> = 0.80 mm ± 0.08 mm; C-TOL. = ± 10 % |                                                |                            |                                             |                                     |      |                                      |      |                                          |      |
|                                                         | 0.18                                                                        | 7.0 x 13.5 x 17.5                              | 1.8                        | 10184                                       | 12184                               | 750  | 14184                                | 500  | 16184                                    | 800  |
|                                                         | 0.22                                                                        |                                                |                            | 10224                                       | 12224                               |      | 14224                                |      | 16224                                    |      |
|                                                         | 0.27                                                                        | 8.5 x 15.0 x 17.5                              | 2.4                        | 10274                                       | 12274                               | 750  | 14274                                | 500  | 16274                                    | 650  |
|                                                         | 0.33                                                                        |                                                |                            | 10334                                       | 12334                               |      | 14334                                |      | 16334                                    |      |
|                                                         | 0.39                                                                        | 10.0 x 16.5 x 17.5                             | 3.0                        | 10394                                       | 12394                               | 500  | 14394                                | 450  | 16394                                    | 600  |
|                                                         | 0.47                                                                        |                                                |                            | 10474                                       | 12474                               |      | 14474                                |      | 16474                                    |      |
|                                                         | 0.56                                                                        | 11.0 x 18.5 x 18.0                             | 4.3                        | 90167                                       | 90157                               | 225  | 90144                                | 400  | -                                        | -    |



| ELECTRICAL DATA AND ORDERING INFORMATION - PITCH: 15 mm |                                                                            |                                                |                            |                                             |                                     |      |                                      |      |                                          |      |  |
|---------------------------------------------------------|----------------------------------------------------------------------------|------------------------------------------------|----------------------------|---------------------------------------------|-------------------------------------|------|--------------------------------------|------|------------------------------------------|------|--|
| U <sub>RAC</sub><br>(V)                                 | CAP.<br>(μF)                                                               | DIMENSIONS <sup>(1)</sup><br>w x h x l<br>(mm) | MASS<br>(g) <sup>(2)</sup> | CATALOG NUMBER BFC2 339 XXXXX AND PACKAGING |                                     |      |                                      |      |                                          |      |  |
|                                                         |                                                                            |                                                |                            | LOOSE IN BOX                                |                                     |      |                                      |      | LARGE REEL<br>(500 mm) <sup>(3)(4)</sup> |      |  |
|                                                         |                                                                            |                                                |                            | SHORT LEADS                                 |                                     |      | LONG LEADS                           |      | H = 18.5 mm<br>P <sub>0</sub> = 12.7 mm  |      |  |
|                                                         |                                                                            |                                                |                            | l <sub>t</sub> = 3.5 mm<br>± 0.3 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  |                                          | SPQ  |  |
| 310                                                     | PITCH = 15 mm ± 0.4 mm; d <sub>t</sub> = 0.60 mm ± 0.06 mm; C-TOL. = ± 5 % |                                                |                            |                                             |                                     |      |                                      |      |                                          |      |  |
|                                                         | 0.010                                                                      | 5.0 x 11.0 x 17.5                              | 1.0                        | 90221                                       | 90232                               | 1250 | 90243                                | 1000 | 90254                                    | 1100 |  |
|                                                         | 0.012                                                                      |                                                |                            | 90222                                       | 90233                               |      | 90244                                |      | 90255                                    |      |  |
|                                                         | 0.015                                                                      |                                                |                            | 90223                                       | 90234                               |      | 90245                                |      | 90256                                    |      |  |
|                                                         | 0.018                                                                      |                                                |                            | 90224                                       | 90235                               |      | 90246                                |      | 90257                                    |      |  |
|                                                         | 0.022                                                                      |                                                |                            | 90225                                       | 90236                               |      | 90247                                |      | 90258                                    |      |  |
|                                                         | 0.027                                                                      |                                                |                            | 90226                                       | 90237                               |      | 90248                                |      | 90259                                    |      |  |
|                                                         | 0.033                                                                      |                                                |                            | 90227                                       | 90238                               |      | 90249                                |      | 90261                                    |      |  |
|                                                         | 0.039                                                                      |                                                |                            | 90228                                       | 90239                               |      | 90251                                |      | 90262                                    |      |  |
|                                                         | 0.047                                                                      |                                                |                            | 90229                                       | 90241                               |      | 90252                                |      | 90263                                    |      |  |
|                                                         | 0.056                                                                      |                                                |                            | 90231                                       | 90242                               |      | 90253                                |      | 90264                                    |      |  |
|                                                         | 0.068                                                                      |                                                |                            | 51683                                       | 53683                               |      | 55683                                |      | 46683                                    |      |  |
|                                                         | 0.082                                                                      |                                                |                            | 51823                                       | 53823                               |      | 55823                                |      | 46823                                    |      |  |
|                                                         | 0.10                                                                       |                                                |                            | 50104                                       | 52104                               |      | 54104                                |      | 36104                                    |      |  |
|                                                         | 0.12                                                                       | 6.0 x 12.0 x 17.5                              | 1.4                        | 50124                                       | 52124                               | 1000 | 54124                                | 1000 | 36124                                    | 900  |  |
|                                                         | 0.15                                                                       |                                                |                            | 50154                                       | 52154                               |      | 54154                                |      | 36154                                    |      |  |
|                                                         | PITCH = 15 mm ± 0.4 mm; d <sub>t</sub> = 0.80 mm ± 0.08 mm; C-TOL. = ± 5 % |                                                |                            |                                             |                                     |      |                                      |      |                                          |      |  |
|                                                         | 0.18                                                                       | 7.0 x 13.5 x 17.5                              | 1.8                        | 50184                                       | 52184                               | 750  | 54184                                | 500  | 36184                                    | 800  |  |
|                                                         | 0.22                                                                       | 8.5 x 15.0 x 17.5                              | 2.4                        | 50224                                       | 52224                               | 750  | 54224                                | 500  | 36224                                    | 650  |  |
|                                                         | 0.27                                                                       |                                                |                            | 50274                                       | 52274                               |      | 54274                                |      | 36274                                    |      |  |
|                                                         | 0.33                                                                       |                                                |                            | 50334                                       | 52334                               |      | 54334                                |      | 36334                                    |      |  |
|                                                         | 0.39                                                                       | 10.0 x 16.5 x 17.5                             | 3.0                        | 50394                                       | 52394                               | 500  | 54394                                | 450  | 36394                                    | 600  |  |

## Notes

- SPQ = Standard Packing Quantity
- (1) For tolerances see section "Space Requirements for Printed-Circuit Board Applications and Dimension Tolerances"
- (2) Weight for short lead product only
- (3) H = in-tape height; P<sub>0</sub> = sprocket hole distance; for detailed specifications refer to packaging information
- (4) Reel diameter = 356 mm is available on request

| ELECTRICAL DATA AND ORDERING INFORMATION - PITCH: 22.5 mm |                                                                               |                                                |                            |                                             |                                     |     |                                      |     |                                          |     |
|-----------------------------------------------------------|-------------------------------------------------------------------------------|------------------------------------------------|----------------------------|---------------------------------------------|-------------------------------------|-----|--------------------------------------|-----|------------------------------------------|-----|
| U <sub>RAC</sub><br>(V)                                   | CAP.<br>(μF)                                                                  | DIMENSIONS <sup>(1)</sup><br>w x h x l<br>(mm) | MASS<br>(g) <sup>(2)</sup> | CATALOG NUMBER BFC2 339 XXXXX AND PACKAGING |                                     |     |                                      |     |                                          |     |
|                                                           |                                                                               |                                                |                            | LOOSE IN BOX                                |                                     |     |                                      |     | LARGE REEL<br>(500 mm) <sup>(3)(4)</sup> |     |
|                                                           |                                                                               |                                                |                            | SHORT LEADS                                 |                                     |     | LONG LEADS                           |     | H = 18.5 mm<br>P <sub>0</sub> = 12.7 mm  |     |
|                                                           |                                                                               |                                                |                            | l <sub>t</sub> = 3.5 mm<br>± 0.3 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 |                                          | SPQ |
| 310                                                       | PITCH = 22.5 mm ± 0.4 mm; d <sub>t</sub> = 0.80 mm ± 0.08 mm; C-TOL. = ± 20 % |                                                |                            |                                             |                                     |     |                                      |     |                                          |     |
|                                                           | 0.15                                                                          | 6.0 x 15.5 x 26.0                              | 2.4                        | 21154                                       | 23154                               | 300 | 25154                                | 250 | 27154                                    | 600 |
|                                                           | 0.22                                                                          |                                                |                            | 21224                                       | 23224                               |     | 25224                                |     | 27224                                    |     |
|                                                           | 0.33                                                                          |                                                |                            | 21334                                       | 23334                               |     | 25334                                |     | 27334                                    |     |
|                                                           | 0.47                                                                          | 7.0 x 16.5 x 26.0                              | 2.9                        | 21474                                       | 23474                               | 200 | 25474                                | 250 | 27474                                    | 500 |
|                                                           | 0.68                                                                          | 8.5 x 18.0 x 26.0                              | 3.8                        | 20684                                       | 22684                               | 200 | 24684                                | 250 | 26684                                    | 450 |
|                                                           | 1.0                                                                           | 10.0 x 19.5 x 26.0                             | 6.8                        | 20105                                       | 22105                               | 200 | 24105                                | 200 | 26105                                    | 350 |
|                                                           | 1.5                                                                           | 12.5 x 22.5 x 26.5                             | 10                         | 90103                                       | 90138                               | 140 | 90139                                | 400 | 90141                                    | 300 |



| ELECTRICAL DATA AND ORDERING INFORMATION - PITCH: 22.5 mm |                                                                               |                                                |                            |                                             |                                     |       |                                      |     |                                          |     |
|-----------------------------------------------------------|-------------------------------------------------------------------------------|------------------------------------------------|----------------------------|---------------------------------------------|-------------------------------------|-------|--------------------------------------|-----|------------------------------------------|-----|
| U <sub>RAC</sub><br>(V)                                   | CAP.<br>(μF)                                                                  | DIMENSIONS <sup>(1)</sup><br>w x h x l<br>(mm) | MASS<br>(g) <sup>(2)</sup> | CATALOG NUMBER BFC2 339 XXXXX AND PACKAGING |                                     |       |                                      |     |                                          |     |
|                                                           |                                                                               |                                                |                            | LOOSE IN BOX                                |                                     |       |                                      |     | LARGE REEL<br>(500 mm) <sup>(3)(4)</sup> |     |
|                                                           |                                                                               |                                                |                            | SHORT LEADS                                 |                                     |       | LONG LEADS                           |     | H = 18.5 mm<br>P <sub>0</sub> = 12.7 mm  |     |
|                                                           |                                                                               |                                                |                            | I <sub>t</sub> = 3.5 mm<br>± 0.3 mm         | I <sub>t</sub> = 5.0 mm<br>± 1.0 mm | SPQ   | I <sub>t</sub> = 25.0 mm<br>± 2.0 mm | SPQ |                                          | SPQ |
| 310                                                       | PITCH = 22.5 mm ± 0.4 mm; d <sub>t</sub> = 0.80 mm ± 0.08 mm; C-TOL. = ± 10 % |                                                |                            |                                             |                                     |       |                                      |     |                                          |     |
|                                                           | 0.12                                                                          | 6.0 x 15.5 x 26.0                              | 2.4                        | 11124                                       | 13124                               | 300   | 15124                                | 250 | 17124                                    | 600 |
|                                                           | 0.15                                                                          |                                                |                            | 11154                                       | 13154                               |       | 15154                                |     | 17154                                    |     |
|                                                           | 0.18                                                                          |                                                |                            | 11184                                       | 13184                               |       | 15184                                |     | 17184                                    |     |
|                                                           | 0.22                                                                          |                                                |                            | 11224                                       | 13224                               |       | 15224                                |     | 17224                                    |     |
|                                                           | 0.27                                                                          |                                                |                            | 11274                                       | 13274                               |       | 15274                                |     | 17274                                    |     |
|                                                           | 0.33                                                                          |                                                |                            | 11334                                       | 13334                               |       | 15334                                |     | 17334                                    |     |
|                                                           | 0.33                                                                          | 8.5 x 14.0 x 26.5                              | 3.6                        | -                                           | -                                   | -     | 75334                                | 800 | -                                        | -   |
|                                                           | 0.39                                                                          | 7.0 x 16.5 x 26.0                              | 2.9                        | 11394                                       | 13394                               | 200   | 15394                                | 250 | 17394                                    | 500 |
|                                                           | 0.47                                                                          |                                                |                            | 11474                                       | 13474                               |       | 15474                                |     | 17474                                    |     |
|                                                           | 0.47                                                                          | 8.5 x 14.0 x 26.5                              | 3.6                        | -                                           | -                                   | -     | 75474                                | 800 | -                                        | -   |
|                                                           | 0.56                                                                          | 8.5 x 18.0 x 26.0                              | 3.8                        | 10564                                       | 12564                               | 200   | 14564                                | 250 | 16564                                    | 450 |
|                                                           | 0.68                                                                          | 10.0 x 19.5 x 26.0                             | 6.8                        | 10684                                       | 12684                               | 200   | 14684                                | 200 | 16684                                    | 350 |
|                                                           | 0.82                                                                          |                                                |                            | 10824                                       | 12824                               |       | 14824                                |     | 16824                                    |     |
|                                                           | 1.0                                                                           | 12.0 x 22.0 x 26.0                             | 7.8                        | 10105                                       | 12105                               | 150   | 14105                                | 200 | 16105                                    | 300 |
|                                                           | PITCH = 22.5 mm ± 0.4 mm; d <sub>t</sub> = 0.80 mm ± 0.08 mm; C-TOL. = ± 5 %  |                                                |                            |                                             |                                     |       |                                      |     |                                          |     |
|                                                           | 0.12                                                                          | 6.0 x 15.5 x 26.0                              | 2.4                        | 51124                                       | 53124                               | 300   | 55124                                | 250 | 46124                                    | 600 |
|                                                           | 0.15                                                                          |                                                |                            | 51154                                       | 53154                               |       | 55154                                |     | 46154                                    |     |
|                                                           | 0.18                                                                          |                                                |                            | 51184                                       | 53184                               |       | 55184                                |     | 46184                                    |     |
|                                                           | 0.22                                                                          |                                                |                            | 51224                                       | 53224                               |       | 55224                                |     | 46224                                    |     |
|                                                           | 0.27                                                                          |                                                |                            | 51274                                       | 53274                               |       | 55274                                |     | 46274                                    |     |
|                                                           | 0.33                                                                          |                                                |                            | 7.0 x 16.5 x 26.0                           | 2.9                                 |       | 51334                                |     | 53334                                    |     |
|                                                           | 0.39                                                                          | 51394                                          | 53394                      |                                             |                                     | 55394 | 46394                                |     |                                          |     |
|                                                           | 0.47                                                                          | 8.5 x 18.0 x 26.0                              | 3.8                        | 51474                                       | 53474                               | 200   | 55474                                | 250 | 46474                                    | 450 |
|                                                           | 0.56                                                                          |                                                |                            | 50564                                       | 52564                               |       | 54564                                |     | 36564                                    |     |
|                                                           | 0.68                                                                          | 10.0 x 19.5 x 26.0                             | 6.8                        | 50684                                       | 52684                               | 200   | 54684                                | 200 | 36684                                    | 350 |
|                                                           | 0.82                                                                          |                                                |                            | 50824                                       | 52824                               |       | 54824                                |     | 36824                                    |     |
|                                                           | 1.0                                                                           | 12.0 x 22.0 x 26.0                             | 7.8                        | 50105                                       | 52105                               | 150   | 54105                                | 200 | 36105                                    | 300 |

**Notes**

- SPQ = Standard Packing Quantity
- <sup>(1)</sup> For tolerances see section "Space Requirements for Printed-Circuit Board Applications and Dimension Tolerances"
- <sup>(2)</sup> Weight for short lead product only
- <sup>(3)</sup> H = in-tape height; P<sub>0</sub> = sprocket hole distance; for detailed specifications refer to packaging information
- <sup>(4)</sup> Reel diameter = 356 mm is available on request



| ELECTRICAL DATA AND ORDERING INFORMATION - PITCH: 27.5 mm |                                                                               |                                                |                            |                                             |                                  |     |                                   |     |
|-----------------------------------------------------------|-------------------------------------------------------------------------------|------------------------------------------------|----------------------------|---------------------------------------------|----------------------------------|-----|-----------------------------------|-----|
| U <sub>RAC</sub><br>(V)                                   | CAP.<br>(μF)                                                                  | DIMENSIONS <sup>(1)</sup><br>w x h x l<br>(mm) | MASS<br>(g) <sup>(2)</sup> | CATALOG NUMBER BFC2 339 XXXXX AND PACKAGING |                                  |     |                                   |     |
|                                                           |                                                                               |                                                |                            | LOOSE IN BOX                                |                                  |     |                                   |     |
|                                                           |                                                                               |                                                |                            | SHORT LEADS                                 |                                  |     | LONG LEADS                        |     |
|                                                           |                                                                               |                                                |                            | I <sub>t</sub> = 3.5 mm ± 0.3 mm            | I <sub>t</sub> = 5.0 mm ± 1.0 mm | SPQ | I <sub>t</sub> = 25.0 mm ± 2.0 mm | SPQ |
| 310                                                       | PITCH = 27.5 mm ± 0.4 mm; d <sub>t</sub> = 0.80 mm ± 0.08 mm; C-TOL. = ± 20 % |                                                |                            |                                             |                                  |     |                                   |     |
|                                                           | 0.47<br>0.68                                                                  | 9.0 x 19.0 x 31.5                              | 5.5                        | 90076<br>21684                              | 90078<br>23684                   | 100 | 90081<br>25684                    | 150 |
|                                                           | 1.0                                                                           | 11.0 x 21.0 x 31.0                             | 7.4                        | 21105                                       | 23105                            | 100 | 25105                             | 125 |
|                                                           | 1.5                                                                           | 13.0 x 23.0 x 31.0                             | 9.2                        | 20155                                       | 22155                            | 100 | 24155                             | 125 |
|                                                           | 2.2                                                                           | 15.0 x 25.0 x 31.5                             | 12.3                       | 20225                                       | 22225                            | 100 | 24225                             | 125 |
|                                                           | 3.3                                                                           | 18.0 x 28.0 x 31.5                             | 16.1                       | 20335                                       | 22335                            | 100 | 24335                             | 100 |
|                                                           | 4.7                                                                           | 21.0 x 31.0 x 31.0                             | 20.3                       | 20475                                       | 22475                            | 50  | 24475                             | 75  |
|                                                           | PITCH = 27.5 mm ± 0.4 mm; d <sub>t</sub> = 0.80 mm ± 0.08 mm; C-TOL. = ± 10 % |                                                |                            |                                             |                                  |     |                                   |     |
|                                                           | 0.68                                                                          | 9.0 x 19.0 x 31.5                              | 5.5                        | 11684                                       | 13684                            | 100 | 15684                             | 150 |
|                                                           | 0.82                                                                          | 11.0 x 21.0 x 31.0                             | 7.4                        | 11824                                       | 13824                            | 100 | 15824                             | 125 |
|                                                           | 1.0                                                                           |                                                |                            | 11105                                       | 13105                            |     | 15105                             |     |
|                                                           | 1.2                                                                           |                                                |                            | 10125                                       | 12125                            |     | 14125                             |     |
|                                                           | 1.5                                                                           | 13.0 x 23.0 x 31.0                             | 9.2                        | 10155                                       | 12155                            | 100 | 14155                             | 125 |
|                                                           | 1.8<br>2.2                                                                    | 15.0 x 25.0 x 31.5                             | 12.3                       | 10185<br>10225                              | 12185<br>12225                   | 100 | 14185<br>14225                    | 125 |
|                                                           | 2.7                                                                           | 18.0 x 28.0 x 31.5                             | 16.1                       | 10275                                       | 12275                            | 100 | 14275                             | 100 |
|                                                           | 3.3<br>3.9                                                                    | 21.0 x 31.0 x 31.0                             | 20.3                       | 10335<br>10395                              | 12335<br>12395                   | 50  | 14335<br>14395                    | 75  |
|                                                           | PITCH = 27.5 mm ± 0.4 mm; d <sub>t</sub> = 0.80 mm ± 0.08 mm; C-TOL. = ± 5 %  |                                                |                            |                                             |                                  |     |                                   |     |
|                                                           | 0.68                                                                          | 9.0 x 19.0 x 31.5                              | 5.5                        | 51684                                       | 53684                            | 100 | 55684                             | 150 |
|                                                           | 0.82<br>1.0                                                                   | 11.0 x 21.0 x 31.0                             | 7.4                        | 51824<br>51105                              | 53824<br>53105                   | 100 | 55824<br>55105                    | 125 |
|                                                           | 1.2<br>1.5                                                                    | 13.0 x 23.0 x 31.0                             | 9.2                        | 50125<br>50155                              | 52125<br>52155                   | 100 | 54125<br>54155                    | 125 |
|                                                           | 1.8                                                                           | 15.0 x 25.0 x 31.5                             | 12.3                       | 50185                                       | 52185                            | 100 | 54185                             | 125 |
|                                                           | 2.2<br>2.7                                                                    | 18.0 x 28.0 x 31.5                             | 16.1                       | 50225<br>50275                              | 52225<br>52275                   | 100 | 54225<br>54275                    | 100 |
|                                                           | 3.3                                                                           | 21.0 x 31.0 x 31.0                             | 20.3                       | 50335                                       | 52335                            | 50  | 54335                             | 75  |

**Notes**

- SPQ = Standard Packing Quantity

<sup>(1)</sup> For tolerances see section "Space Requirements for Printed-Circuit Board Applications and Dimension Tolerances"

<sup>(2)</sup> Weight for short lead product only

| APPROVALS                                                                                                                                                                                                                                                                                                                                                           |                     |                |                       |                                                                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|----------------|-----------------------|------------------------------------------------------------------------|
| SAFETY APPROVALS X2                                                                                                                                                                                                                                                                                                                                                 | VOLTAGE             | VALUE          | FILE NUMBERS          | LINK                                                                   |
| EN 60384-14 (ENEC)<br>(= IEC 60384-14 ed-4 (2013))                                                                                                                                                                                                                                                                                                                  | 310 V <sub>AC</sub> | 1 nF to 4.7 µF | ENEC16/FI/21/01054/A2 | <a href="http://www.vishay.com/doc?28179">www.vishay.com/doc?28179</a> |
| UL 60384-14                                                                                                                                                                                                                                                                                                                                                         | 310 V <sub>AC</sub> | 1 nF to 4.7 µF | E354331               | <a href="http://www.vishay.com/doc?28184">www.vishay.com/doc?28184</a> |
| CSA-E384-14                                                                                                                                                                                                                                                                                                                                                         | 310 V <sub>AC</sub> | 1 nF to 4.7 µF | E354331               |                                                                        |
| CQC                                                                                                                                                                                                                                                                                                                                                                 | 310 V <sub>AC</sub> | 1 nF to 4.7 µF | CQC 07001021281 (L)   | <a href="http://www.vishay.com/doc?28180">www.vishay.com/doc?28180</a> |
|                                                                                                                                                                                                                                                                                                                                                                     |                     |                | CQC 06001018290 (F)   | <a href="http://www.vishay.com/doc?28181">www.vishay.com/doc?28181</a> |
| CB test certificate                                                                                                                                                                                                                                                                                                                                                 | 310 V <sub>AC</sub> | 1 nF to 4.7 µF | FI-39827/A1           | <a href="http://www.vishay.com/doc?28175">www.vishay.com/doc?28175</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 in printed-circuit boards by means of automatic insertion machines.

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

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

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

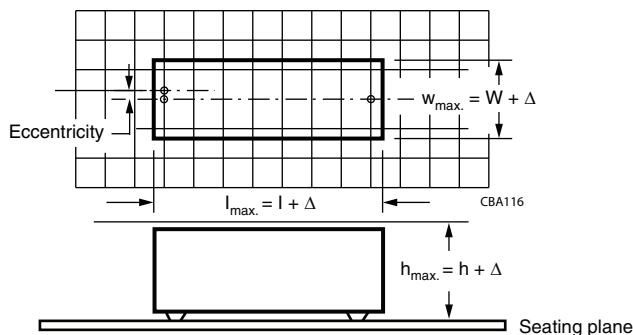
- For pitches  $\leq 15$  mm capacitors shall be mechanically fixed by the leads.
- For larger pitches the capacitors shall be mounted in the same way and the body clamped.

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

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

- For products with pitch  $\leq 15$  mm,  $\Delta w = \Delta l = 0.3$  mm,  $\Delta h = 0.1$  mm
- For products with  $15$  mm  $<$  pitch  $\leq 27.5$  mm,  $\Delta w = \Delta l = 0.5$  mm,  $\Delta h = 0.1$  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  $\leq 10$  mm,  $\Delta l = 0.3$  mm and  $\Delta w = \Delta h = 0.3$  mm
- For products with pitch = 15 mm,  $\Delta l = 0.5$  mm and  $\Delta w = \Delta h = 0.5$  mm
- For products with  $15$  mm  $<$  pitch  $\leq 27.5$  mm,  $\Delta l = 1.0$  mm and  $\Delta w = \Delta h = 0.5$  mm



## SOLDERING CONDITIONS

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

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

## Storage Temperature

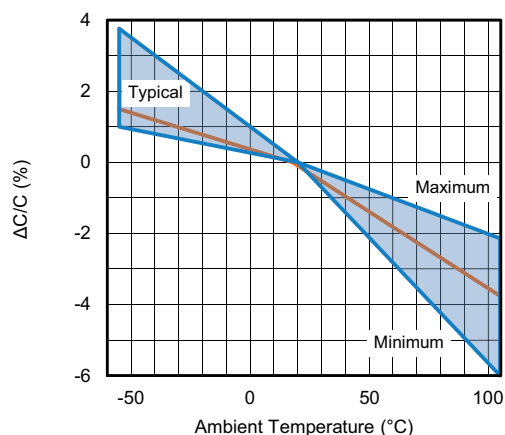
$T_{\text{stg}} = -25\text{ }^{\circ}\text{C}$  to  $+35\text{ }^{\circ}\text{C}$ , RH maximum 75 % without condensation

## Ratings and Characteristics Reference Conditions

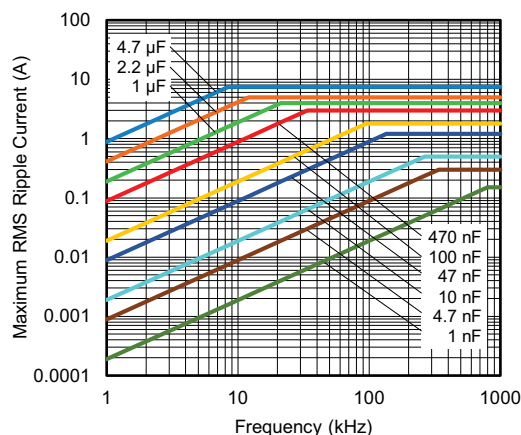
Unless otherwise specified, all electrical values apply to an ambient temperature of  $23\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$ , an atmospheric pressure of 86 kPa to 106 kPa and a relative humidity of  $50\text{ } \pm 2\text{ } \%$ .

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

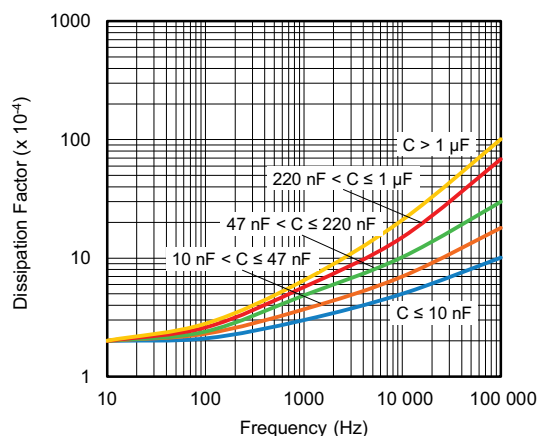
## CHARACTERISTICS



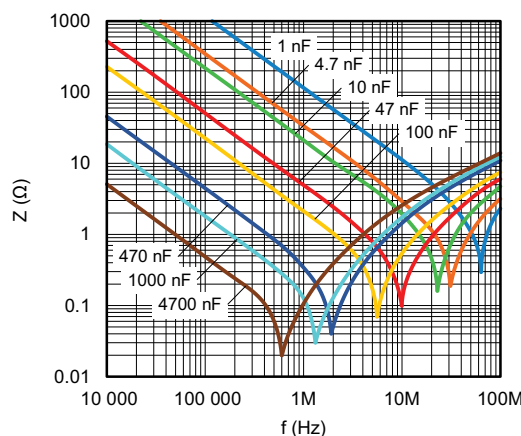
Capacitance as a function of ambient temperature (typical curve)



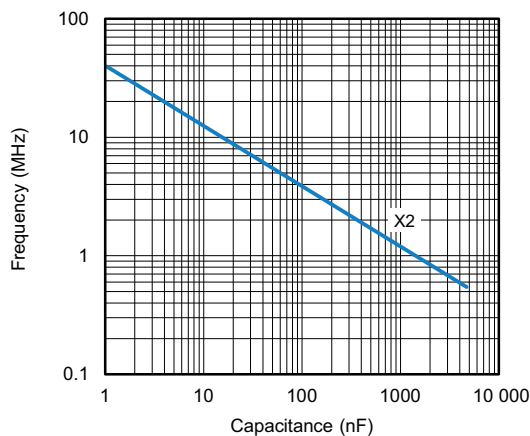
Maximum RMS current as a function of frequency



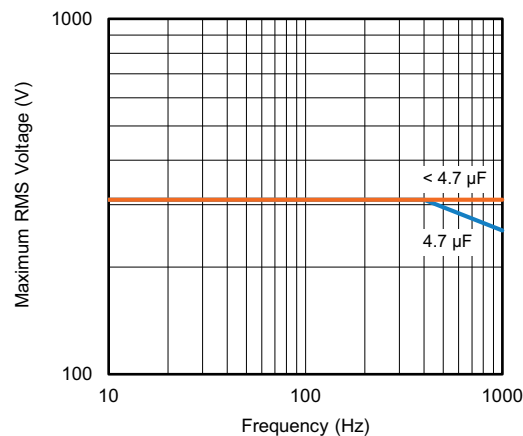
Tangent of loss angle as a function of frequency (typical curve)



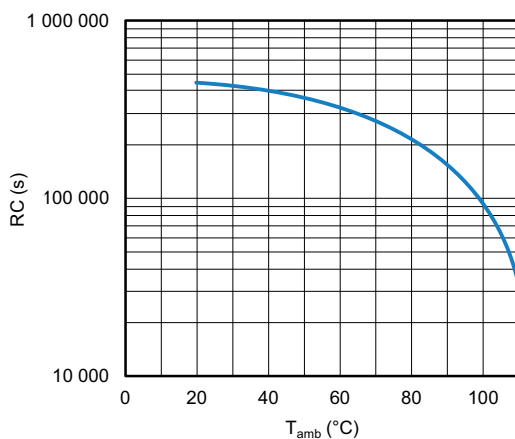
Impedance as a function of frequency (typical curve)



Resonant frequency as a function of capacitance  
(typical curve)



Maximum RMS voltage as a function of frequency



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

## APPLICATION NOTES

- For X2 electromagnetic interference suppression in **standard across the line applications** (50 Hz / 60 Hz) with a maximum mains voltage of 310 V<sub>AC</sub>
- For series impedance applications we refer to 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 application. For these situations capacitors of the AC and pulse programs must be used
- The maximum ambient temperature must not exceed 110 °C (125 °C for less than 1000 h) for C ≤ 470 nF and 110 °C for C > 470 nF
- 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 435 V<sub>DC</sub> 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-4 (2013) 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 section “General data” of this specification                                                                                                 |
| Initial measurements                                | Capacitance<br>Tangent of loss angle:<br>For $C \leq 1 \mu\text{F}$ at 10 kHz<br>For $C > 1 \mu\text{F}$ at 1 kHz                                |                                                                                                                                                              |
| 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                                            |                                                                                                                                                              |
| 4.19 Component solvent resistance                   | Isopropylalcohol at room temperature<br>Method: 2<br>Immersion time: $5 \text{ min} \pm 0.5 \text{ min}$<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 5 \%$ of the value measured initially.                                                                                                    |
|                                                     | Tangent of loss angle                                                                                                                            | Increase of $\tan \delta$ :<br>$\leq 0.008$ for: $C \leq 1 \mu\text{F}$ or<br>$\leq 0.005$ for: $C > 1 \mu\text{F}$<br>Compared to values measured initially |
|                                                     | Insulation resistance                                                                                                                            | As specified in section “Insulation Resistance” of this specification                                                                                        |
| <b>SUB-GROUP C1B PART OF SAMPLE OF SUB-GROUP C1</b> |                                                                                                                                                  |                                                                                                                                                              |
| Initial measurements                                | Capacitance<br>Tangent of loss angle:<br>For $C \leq 1 \mu\text{F}$ at 10 kHz<br>For $C > 1 \mu\text{F}$ at 1 kHz                                |                                                                                                                                                              |
| 4.20 Solvent resistance of the marking              | Isopropylalcohol at room temperature<br>Method: 1<br>Rubbing material: Cotton wool<br>Immersion time: $5 \text{ min} \pm 0.5 \text{ min}$        | No visible damage<br>Legible marking                                                                                                                         |



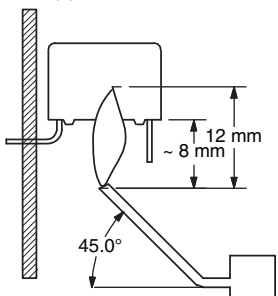
| GROUP C INSPECTION REQUIREMENTS                                            |                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SUB-CLAUSE NUMBER AND TEST                                                 | CONDITIONS                                                                                                                                                                                                           | PERFORMANCE REQUIREMENTS                                                                                                                                                                                                                                                                                                                         |
| <b>SUB-GROUP C1B PART OF SAMPLE OF SUB-GROUP C1</b>                        |                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                  |
| 4.6 Rapid change of temperature                                            | $\theta A = -55\text{ }^{\circ}\text{C}$<br>$\theta B = +110\text{ }^{\circ}\text{C}$<br>5 cycles<br>Duration $t = 30\text{ min}$                                                                                    |                                                                                                                                                                                                                                                                                                                                                  |
| 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 acceleration 98 m/s <sup>2</sup> (whichever is less severe)<br>Total duration 6 h |                                                                                                                                                                                                                                                                                                                                                  |
| 4.7.2 Final inspection                                                     | Visual examination                                                                                                                                                                                                   | No visible damage                                                                                                                                                                                                                                                                                                                                |
| 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><br>Capacitance<br><br>Tangent of loss angle<br><br>Insulation resistance                                                                                                                      | No visible damage<br><br>$ \Delta C/C  \leq 5\%$ of the value measured initially.<br><br>Increase of $\tan \delta$ :<br>$\leq 0.008$ for: $C \leq 1\text{ }\mu\text{F}$ or<br>$\leq 0.005$ for: $C > 1\text{ }\mu\text{F}$<br>Compared to values measured initially<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> |                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                  |
| 4.11 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                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                  |



| GROUP C INSPECTION REQUIREMENTS                                                    |                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SUB-CLAUSE NUMBER AND TEST                                                         | CONDITIONS                                                                                                                                                                | PERFORMANCE REQUIREMENTS                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>SUB-GROUP C1<br/>COMBINED SAMPLE OF SPECIMENS<br/>OF SUB-GROUPS C1A AND C1B</b> |                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 4.11.6 Final measurements                                                          | Visual examination<br><br>Capacitance<br><br>Tangent of loss angle<br><br>Voltage proof<br>1350 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 4.11.1.<br><br>Increase of $\tan \delta$ :<br>$\leq 0.008$ for: $C \leq 1\ \mu\text{F}$ or<br>$\leq 0.005$ for: $C > 1\ \mu\text{F}$<br>Compared to values measured in 4.11.1.<br><br>No permanent breakdown or flash-over<br><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                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 4.12.3 Final measurements                                                          | Visual examination<br><br>Capacitance<br><br>Tangent of loss angle<br><br>Voltage proof<br>1350 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 $\tan \delta$ :<br>$\leq 0.008$ for: $C \leq 1\ \mu\text{F}$ or<br>$\leq 0.005$ for: $C > 1\ \mu\text{F}$<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 "Insulation Resistance" of this specification   |
| <b>SUB-GROUP C3</b>                                                                |                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 4.13.1 Initial measurements                                                        | Capacitance<br>Tangent of loss angle:<br>For $C \leq 1\ \mu\text{F}$ at 10 kHz<br>For $C > 1\ \mu\text{F}$ at 1 kHz                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 4.13 Impulse voltage                                                               | 3 successive impulses, full wave, peak voltage:<br>X2: 2.5 kV for $C \leq 1\ \mu\text{F}$<br>X2: 2.5 kV/ $\sqrt{C}$ for $C > 1\ \mu\text{F}$<br>Max. 24 pulses            | No self healing breakdowns or flash-over                                                                                                                                                                                                                                                                                                                                                                                |



| GROUP C INSPECTION REQUIREMENTS     |                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SUB-CLAUSE NUMBER AND TEST          | CONDITIONS                                                                                                                                                                                                                              | PERFORMANCE REQUIREMENTS                                                                                                                                                                                                                                                                                                                                                  |
| <b>SUB-GROUP C3</b>                 |                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                           |
| 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>1350 V <sub>DC</sub> ; 1 min between terminations<br>2120 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 δ:<br>≤ 0.008 for: C ≤ 1 μF or<br>≤ 0.005 for: C > 1 μF<br>Compared to values measured in 4.13.1<br><br>No permanent breakdown or flash-over<br><br>≥ 50 % of values specified in section "Insulation Resistance" of this specification |
| <b>SUB-GROUP C4</b>                 |                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                           |
| 4.15 Charge and discharge           | 10 000 cycles<br>charged to 435 V <sub>DC</sub><br>Discharge resistance:<br>$R = \frac{435 V_{DC}}{1.25 \times C (dU/dt)}$                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                           |
| 4.15.1 Initial measurements         | Capacitance<br>Tangent of loss angle:<br>For C ≤ 1 μF at 10 kHz<br>For C > 1 μF at 1 kHz                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                           |
| 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 δ:<br>≤ 0.008 for: C ≤ 1 μF or<br>≤ 0.005 for: C > 1 μF<br>Compared to values measured in 4.15.1<br><br>≥ 50 % of values specified in section "Insulation Resistance" of this specification                                                                                        |
| <b>SUB-GROUP C5</b>                 |                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                           |
| 4.16 Radio frequency characteristic | Resonance frequency                                                                                                                                                                                                                     | ≥ 0.9 times the value as specified in section "Resonant Frequency" of this specification.                                                                                                                                                                                                                                                                                 |

| <b>GROUP C INSPECTION REQUIREMENTS</b> |                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SUB-CLAUSE NUMBER AND TEST</b>      | <b>CONDITIONS</b>                                                                                                                                                                                                                                                                                                                                                                                                | <b>PERFORMANCE REQUIREMENTS</b>                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>SUB-GROUP C6</b>                    |                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 4.17 Passive flammability<br>Class B   | <p>Bore of gas jet: <math>\varnothing</math> 0.5 mm<br/> Fuel: butane<br/> Test duration for actual volume V in mm<sup>3</sup>:<br/> <math>V \leq 250</math>: 10 s<br/> <math>250 &lt; V \leq 500</math>: 20 s<br/> <math>500 &lt; V \leq 1750</math>: 30 s<br/> <math>V &gt; 1750</math>: 60 s<br/> One flame application</p>  | 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 2.5 kV discharges on the test capacitor connected to $U_{RAC}$                                                                                                                                                                                                                                                                                                                                      | The cheese cloth around the capacitors shall not burn with a flame.<br>No electrical measurements are required.                                                                                                                                                                                                                                                                                                                                            |
| <b>SUB-GROUP ADD 6</b>                 |                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| A.6 Endurance                          | <p>Duration:<br/> 1000 h for <math>C \leq 0.47 \mu F</math><br/> 500 h for <math>C &gt; 0.47 \mu F</math><br/> <math>1.0 \times U_{RAC}</math> at 125 °C</p>                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| A.6.1 Initial measurements             | <p>Capacitance<br/> Tangent of loss angle:<br/> for <math>C \leq 1 \mu F</math> at 10 kHz<br/> for <math>C &gt; 1 \mu F</math> at 1 kHz</p>                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| A.6.2 Final measurements               | <p>Visual examination</p> <p>Capacitance</p> <p>Tangent of loss angle</p> <p>Insulation resistance.</p>                                                                                                                                                                                                                                                                                                          | <p>No visible damage<br/> Legible marking</p> <p><math> \Delta C/C  \leq 10 \%</math> of the value measured in A.6.1</p> <p>Increase of <math>\tan \delta</math>:<br/> <math>\leq 0.008</math> for: <math>C \leq 1 \mu F</math> or<br/> <math>\leq 0.005</math> for: <math>C &gt; 1 \mu F</math></p> <p>Compared to values measured in A.6.1<br/> <math>\geq 50 \%</math> of values specified in section "Insulation resistance" of this specification</p> |
| <b>SUB-GROUP ADD 7</b>                 |                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| A.7 Endurance                          | <p>Duration: 500 h<br/> <math>0.625 \times U_{RDC}</math> at 125 °C</p>                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| A.7.1 Initial measurements             | <p>Capacitance<br/> Tangent of loss angle:<br/> for <math>C \leq 1 \mu F</math> at 10 kHz<br/> for <math>C &gt; 1 \mu F</math> at 1 kHz</p>                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                            |



| <b>GROUP C INSPECTION REQUIREMENTS</b>                                                                    |                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SUB-CLAUSE NUMBER AND TEST</b>                                                                         | <b>CONDITIONS</b>                                                                                                                                                                                                                       | <b>PERFORMANCE REQUIREMENTS</b>                                                                                                                                                                                                                                                                                                                                          |
| <b>SUB-GROUP ADD 7</b>                                                                                    |                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                          |
| A.7.2 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 10\%$ of the value measured in A.7.1<br><br>Increase of $\tan \delta$ :<br>$\leq 0.008$ for: $C \leq 1\ \mu\text{F}$ or<br>$\leq 0.005$ for: $C > 1\ \mu\text{F}$<br><br>Compared to values measured in A.7.1<br>$\geq 50\%$ of values specified in section "Insulation resistance" of this specification |
| <b>SUB-GROUP ADD8</b>                                                                                     |                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                          |
| A.8 Damp heat steady state with voltage<br><br>A.8.1 Initial measurements<br><br>A.8.2 Final measurements | RH: 40 %; temp.: 93 °C, voltage: 310 V <sub>AC</sub><br>Duration: 21 days<br><br>Capacitance<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.8.1<br><br>Increase of $\tan \delta \leq 0.024$<br>Compared to values with initial measurement A.8.1<br><br>$\geq 50\%$ of values specified in section "Insulation Resistance" of this specification                                                        |

**TEST CONDITIONS AND REQUIREMENTS ACCORDING AEC-Q200 REVISION C**

| NO. | TEST NAME                            | REFERENCE              | TEST CONDITIONS                                                       | PERFORMANCE REQUIREMENTS                                                                                                                                                                        |
|-----|--------------------------------------|------------------------|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | Pre- and post-stress electrical test | User spec.             | -                                                                     | -                                                                                                                                                                                               |
| 3   | High temperature exposure (storage)  | MIL-STD 202 method 108 | 1000 h; 110 °C; unpowered                                             | $ \Delta C/C  \leq \pm 5 \%$<br>Increase of $\tan \delta$<br>0.008 for $C \leq 1 \mu\text{F}$ at 10 kHz or<br>0.005 for $C > 1 \mu\text{F}$ at 1 kHz<br>$IR \geq 50 \%$ of initial requirement  |
| 4   | Temperature cycling                  | JESD22 method JA-104   | 1000 cycles: -55 °C to +110 °C<br>10 min. dwell time each             | $ \Delta C/C  \leq \pm 5 \%$<br>Increase of $\tan \delta = 0.008$ at 10 kHz<br>$IR \geq 50 \%$ of initial requirement                                                                           |
| 6   | Moisture resistance                  | MIL-STD 202 method 106 | 10 cycles at 24 h/cycle unpowered                                     | $ \Delta C/C  \leq \pm 5 \%$<br>Increase of $\tan \delta$<br>0.008 for $C \leq 1 \mu\text{F}$ at 10 kHz or<br>0.005 for $C > 1 \mu\text{F}$ at 1 kHz<br>$IR \geq 50 \%$ of initial requirement  |
| 7   | Biased humidity                      | MIL-STD 202 method 103 | 1000 h; 40 °C; 93 % RH with $U_{RAC}$                                 | $ \Delta C/C  \leq \pm 10 \%$<br>Increase of $\tan \delta$<br>0.008 for $C \leq 1 \mu\text{F}$ at 10 kHz or<br>0.005 for $C > 1 \mu\text{F}$ at 1 kHz<br>$IR \geq 50 \%$ of initial requirement |
| 8   | Operational life                     | MIL-STD 202 method 108 | $T_{amb} = 110 \text{ °C}$ ;<br>1000 h; $U_{test} = 1 \times U_{RAC}$ | $ \Delta C/C  \leq \pm 10 \%$<br>Increase of $\tan \delta$<br>0.008 for $C \leq 1 \mu\text{F}$ at 10 kHz or<br>0.005 for $C > 1 \mu\text{F}$ at 1 kHz<br>$IR \geq 50 \%$ of initial requirement |
| 11  | Terminal strength (lead)             | MIL-STD 202 method 211 | Leaded device lead integrity only.                                    | $ \Delta C/C  \leq \pm 5 \%$<br>Increase of $\tan \delta$<br>0.008 for $C \leq 1 \mu\text{F}$ at 10 kHz or<br>0.005 for $C > 1 \mu\text{F}$ at 1 kHz<br>$IR = \text{initial requirement}$       |
| 12  | Resistance to solvents               | MIL-STD 202 method 215 |                                                                       | No visual damage<br>Legible marking                                                                                                                                                             |
| 13  | Mechanical shock                     | MIL-STD 202 method 213 | Figure a of method 213, condition C                                   | No visual damage                                                                                                                                                                                |
| 14  | Vibration                            | MIL-STD 202 method 204 | 5 g's for 20 min;<br>12 cycles, 3 orientations                        | No visual damage                                                                                                                                                                                |
| 15  | Resistance to soldering heat         | MIL-STD 202 method 210 | 260 °C; 10 s                                                          | $ \Delta C/C  \leq \pm 5 \%$<br>Increase of $\tan \delta$<br>0.008 for $C \leq 1 \mu\text{F}$ at 10 kHz or<br>0.005 for $C > 1 \mu\text{F}$ at 1 kHz<br>$IR = \text{initial requirement}$       |
| 18  | Solderability                        | J-STD-002              | 235 °C / 5 s                                                          | Good tinning as evidence by free flowing of the solder with wetting of terminations > 95 %                                                                                                      |
| 19  | Electrical characterization          | User spec.             | -                                                                     | -                                                                                                                                                                                               |
| 20  | Flammability                         | UL 94                  | Electrical test not required                                          | Maximum permitted burning time < 10 s                                                                                                                                                           |



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