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# High Temperature Metallized Polypropylene DC-Link Film Capacitor - 125 °C, THB and AEC-Q200 Qualified




## FEATURES

- Operating temperature up to 125 °C
- THB grade III: high robustness under high humidity - IEC 60384-16 ed. 3 - annex A
- AEC-Q200 qualified, revision E
- High ripple current capability, low ESR, low ESL
- Mounting: radial
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AUTOMOTIVE GRADE

Pb-free

RoHS COMPLIANT

## LINKS TO ADDITIONAL RESOURCES

3D Models

## APPLICATIONS

- Automotive power electronics
- Charging systems
- Industrial power conversion

| QUICK REFERENCE DATA | |
|---|---|
| Rated capacitance range | 1 µF to 140 µF |
| Capacitance tolerance | ± 5 %, ± 10 % |
| Climatic testing class | 40 / 105 / 56 |
| Rated temperature | 85 °C |
| Maximum operating temperature | 125 °C for 500 h |
| Maximum applicable peak to peak ripple voltage | 0.2 x $U_{NDC}$ |
| Reference standards | IEC 61071, IEC 60068, IEC 60384-16<br>AEC-Q200 qualified (rev. E) up to 105 °C |
| Dielectric | Polypropylene film |
| Electrodes | Metallized dielectric capacitor |
| Construction | Mono construction |
| Encapsulation | Plastic case sealed with resin; flame retardant |
| Terminals | Tinned wire |
| Self inductance ($L_S$) | < 1 nH per mm of lead spacing |
| Withstanding DC voltage between terminals (1) | 1.5 $U_{NDC}$ for 10 s, cut off current 10 mA, rise time ≤ 1000 V/s |
| Insulation resistance | RC between leads, after 1 min > 10 000 s, measuring voltage: 500 V |
| Marking | Manufacturer's name; C-value; tolerance; rated voltage; manufacturer's type designation; code for dielectric material, manufacturer location (F or L), year (yy) and week (ww) |

**Notes**

- For more detailed data and test requirements, contact dc-film@vishay.com
- For general information like characteristics and definitions used for film capacitors follow the link: www.vishay.com/doc?28147

(1) See document "Voltage Proof Test for Metalized Film Capacitors" (www.vishay.com/doc?28169)

| DC VOLTAGE RATINGS | | | | | | |
|---|---|---|---|---|---|---|
| $U_{NDC}$ at 70 °C | 600 $V_{DC}$ | 850 $V_{DC}$ | 1100 $V_{DC}$ | 1200 $V_{DC}$ | 1450 $V_{DC}$ | 1600 $V_{DC}$ |
| $U_{NDC}$ at 85 °C | 500 $V_{DC}$ | 700 $V_{DC}$ | 900 $V_{DC}$ | 1000 $V_{DC}$ | 1200 $V_{DC}$ | 1300 $V_{DC}$ |
| $U_{OPDC}$ at 105 °C | 350 $V_{DC}$ | 500 $V_{DC}$ | 700 $V_{DC}$ | 800 $V_{DC}$ | 900 $V_{DC}$ | 950 $V_{DC}$ |
| $U_{OPDC}$ at 125 °C | 250 $V_{DC}$ | 400 $V_{DC}$ | 500 $V_{DC}$ | 600 $V_{DC}$ | 700 $V_{DC}$ | 800 $V_{DC}$ |



For technical questions, contact: dc-film@vishay.com

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## COMPOSITION OF CATALOG NUMBER

| MULTIPLIER (nF) | |
|---|---|
| 10 | 4 |
| 100 | 5 |
| 1000 | 6 |
| 10 000 | 7 |

| CAPACITANCE (numerically) | | |
|---|---|---|
| Example: | | |
| 510 | 1000 nF | 1 µF |
| 610 | 10 000 nF | 10 µF |
| 710 | 100 000 nF | 100 µF |

| P1 (mm) | PITCH CODE |
|---|---|
| 22.5 | I |
| 27.5 | K |
| 37.5 | P |
| 52.5 | Y |

| MKP | 1848e | 6 | 70 | 70 | J | Y | 2 |
|---|---|---|---|---|---|---|---|

TYPE CONSTRUCTION

METALLIZED POLYPROPYLENE

| VOLTAGE |
|---|
| $U_{NDC}$ = 50 = 500 $V_{DC}$ at 85 °C |
| $U_{NDC}$ = 70 = 700 $V_{DC}$ at 85 °C |
| $U_{NDC}$ = 90 = 900 $V_{DC}$ at 85 °C |
| $U_{NDC}$ = 10 = 1000 $V_{DC}$ at 85 °C |
| $U_{NDC}$ = 12 = 1200 $V_{DC}$ at 85 °C |
| $U_{NDC}$ = 13 = 1300 $V_{DC}$ at 85 °C |

| TOLERANCE | |
|---|---|
| J | ± 5 % |
| K | ± 10 % |

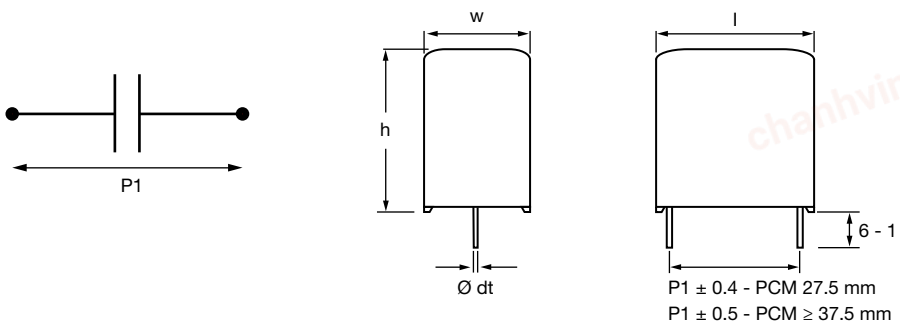
| SPECIAL CODE FOR TERMINAL | |
|---|---|
| 2 | 2 pins |
| 4 | 4 pins P2 = 10.2 mm |
| 5 | 4 pins P2 = 20.3 mm |
| (1) | Customized |

**Note**

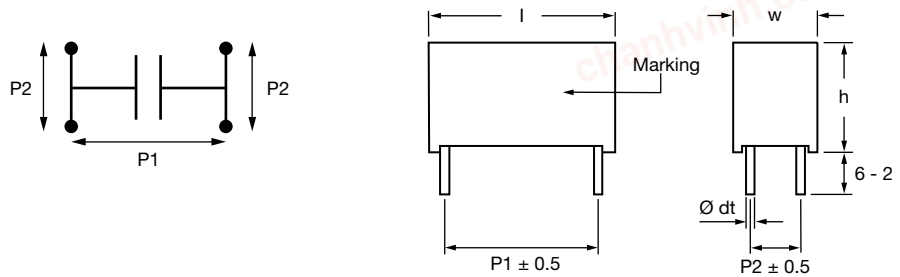
(1) Tabs terminals or customized terminals are available on request

## DIMENSIONS in millimeters

**2 PINS**




**4 PINS**




**Note**

- Ø dt ± 10 % of standard diameter specified



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## ELECTRICAL DATA AND ORDERING CODE

| $U_{NDC}$ AT 85 °C (V) | CAP. (µF) | DIMENSION (5) (mm) | | | P1 (mm) | P2 (mm) | du/dt (V/µs) | $I_{PEAK}$ (A) | $I_{RMS}$ (2) (A) | | ESR (3) 10 kHz (mΩ) | | tan δ (4) 10 kHz < (x $10^{-4}$) | | ORDERING CODE (1) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | w | h | l | | | | | 2 PINS | 4 PINS | 2 PINS | 4 PINS | 2 PINS | 4 PINS | |
| | $U_{OPDC}$ AT 105 °C = 350 V; $U_{OPDC}$ AT 125 °C = 250 V | | | | | | | | | | | | | | |
| 500 | 1 | 7.0 | 16.5 | 26.0 | 22.5 | - | 45 | 45 | 2.8 | - | 36.5 | - | 85 | - | MKP1848e51050+I2 |
| | 2 | 8.5 | 18.0 | 26.0 | 22.5 | - | 45 | 90 | 4.0 | - | 18.0 | - | 85 | - | MKP1848e52050+I2 |
| | 3 | 10.0 | 19.5 | 26.0 | 22.5 | - | 45 | 135 | 5.0 | - | 14.0 | - | 85 | - | MKP1848e53050+I2 |
| | 4 | 10.0 | 19.5 | 26.0 | 22.5 | - | 45 | 180 | 5.5 | - | 12.0 | - | 85 | - | MKP1848e54050+I2 |
| | 6 | 12.0 | 22.0 | 26.0 | 22.5 | - | 45 | 270 | 7.5 | - | 7.0 | - | 85 | - | MKP1848e56050+I2 |
| | 9 | 15.5 | 26.5 | 26.5 | 22.5 | - | 45 | 405 | 10.5 | - | 4.5 | - | 85 | - | MKP1848e59050+I2 |
| | 12 | 18 | 29.5 | 26.5 | 22.5 | - | 45 | 540 | 12.0 | - | 3.5 | - | 85 | - | MKP1848e61250+I2 |
| | 15 | 18 | 29.5 | 26.5 | 22.5 | - | 45 | 675 | 15.0 | - | 3.0 | - | 85 | - | MKP1848e61550+I2 |
| | 6 | 11.0 | 21.0 | 32.0 | 27.5 | - | 25 | 150 | 6.0 | - | 8.5 | - | 85 | - | MKP1848e56050+K2 |
| | 9 | 13.0 | 23.0 | 32.0 | 27.5 | - | 25 | 225 | 8.0 | - | 6.0 | - | 85 | - | MKP1848e59050+K2 |
| | 12 | 15.0 | 25.0 | 32.0 | 27.5 | - | 25 | 300 | 9.5 | - | 5.0 | - | 85 | - | MKP1848e61250+K2 |
| | 15 | 18.0 | 28.0 | 32.0 | 27.5 | - | 25 | 375 | 11.0 | - | 4.5 | - | 85 | - | MKP1848e61550+K2 |
| | 22 | 21.0 | 31.0 | 32.0 | 27.5 | - | 25 | 550 | 14.5 | - | 3.0 | - | 100 | - | MKP1848e62250+K2 |
| | 30 | 22.0 | 38.0 | 32.0 | 27.5 | - | 25 | 750 | 18.5 | - | 2.0 | - | 120 | - | MKP1848e63050+K2 |
| | 35 | 18.5 | 35.5 | 42.0 | 37.5 | 10.2 | 10 | 350 | 13.0 | 15.5 | 4.0 | 3.5 | 155 | 150 | MKP1848e63550+P* |
| | 45 | 21.5 | 38.5 | 42.0 | 37.5 | 10.2 | 10 | 450 | 16.5 | 18.0 | 3.5 | 3.0 | 155 | 150 | MKP1848e64550+P* |
| | 60 | 24.0 | 44.0 | 42.0 | 37.5 | 10.2 | 10 | 600 | 20.0 | 25.0 | 2.5 | 2.0 | 160 | 155 | MKP1848e66050+P* |
| | 80 | 30.0 | 45.0 | 42.0 | 37.5 | 10.2 / 20.3 | 10 | 800 | 25.0 | 33.0 | 2.0 | 1.5 | 160 | 155 | MKP1848e68050+P* |
| | 90 | 25.0 | 45.0 | 57.5 | 52.5 | 10.2 | 5 | 450 | 20.0 | 22.5 | 3.5 | 3.0 | 310 | 310 | MKP1848e69050+Y* |
| | 110 | 30.0 | 45.0 | 57.5 | 52.5 | 20.3 | 5 | 550 | 23.5 | 26.0 | 3.0 | 2.5 | 310 | 310 | MKP1848e71150+Y* |
| | 140 | 35.0 | 50.0 | 57.5 | 52.5 | 20.3 | 5 | 700 | 31.5 | 44.5 | 1.5 | 1.0 | 320 | 315 | MKP1848e71450+Y* |
| 700 | $U_{OPDC}$ AT 105 °C = 500 V; $U_{OPDC}$ AT 125 °C = 400 V | | | | | | | | | | | | | | |
| | 1 | 10.0 | 19.5 | 26.0 | 22.5 | - | 75 | 75 | 3.0 | - | 32.0 | - | 75 | - | MKP1848e51070+I2 |
| | 2 | 10.0 | 19.5 | 26.0 | 22.5 | - | 75 | 150 | 4.5 | - | 25.0 | - | 75 | - | MKP1848e52070+I2 |
| | 3 | 12.0 | 22.0 | 26.0 | 22.5 | - | 75 | 225 | 5.5 | - | 11.0 | - | 75 | - | MKP1848e53070+I2 |
| | 4 | 15.5 | 26.5 | 26.5 | 22.5 | - | 75 | 300 | 8.0 | - | 7.5 | - | 75 | - | MKP1848e54070+I2 |
| | 5 | 18.0 | 29.5 | 26.5 | 22.5 | - | 75 | 375 | 9.0 | - | 6.0 | - | 75 | - | MKP1848e55070+I2 |
| | 2 | 9.0 | 19.0 | 32.0 | 27.5 | - | 40 | 80 | 3.5 | - | 25.0 | - | 75 | - | MKP1848e52070+K2 |
| | 3 | 11.0 | 21.0 | 32.0 | 27.5 | - | 40 | 120 | 4.5 | - | 16.5 | - | 75 | - | MKP1848e53070+K2 |
| | 4 | 13.0 | 23.0 | 32.0 | 27.5 | - | 40 | 160 | 5.5 | - | 12.5 | - | 75 | - | MKP1848e54070+K2 |
| | 5 | 15.0 | 25.0 | 32.0 | 27.5 | - | 40 | 200 | 6.5 | - | 10.0 | - | 75 | - | MKP1848e55070+K2 |
| | 7 | 18.0 | 28.0 | 32.0 | 27.5 | - | 40 | 280 | 9.0 | - | 7.0 | - | 75 | - | MKP1848e57070+K2 |
| | 10 | 21.0 | 31.0 | 32.0 | 27.5 | - | 40 | 400 | 11.5 | - | 5.0 | - | 85 | - | MKP1848e61070+K2 |
| | 15 | 22.0 | 38.0 | 32.0 | 27.5 | - | 40 | 600 | 15.5 | - | 3.0 | - | 95 | - | MKP1848e61570+K2 |
| | 16 | 18.5 | 35.5 | 42.0 | 37.5 | 10.2 | 40 | 320 | 11.5 | 12.5 | 6.0 | 5.5 | 140 | 135 | MKP1848e61670+P* |
| | 20 | 21.5 | 38.5 | 42.0 | 37.5 | 10.2 | 20 | 400 | 14.5 | 15.5 | 4.5 | 4.0 | 140 | 135 | MKP1848e62070+P* |
| | 25 | 24.0 | 44.0 | 42.0 | 37.5 | 10.2 | 20 | 500 | 17.5 | 19.5 | 3.5 | 3.0 | 145 | 140 | MKP1848e62570+P* |
| | 35 | 30.0 | 45.0 | 42.0 | 37.5 | 10.2 / 20.3 | 20 | 700 | 25.0 | 29.0 | 2.5 | 2.0 | 145 | 140 | MKP1848e63570+P* |
| | 40 | 25.0 | 45.0 | 57.5 | 52.5 | 10.2 | 10 | 400 | 18.0 | 19.5 | 4.5 | 4.0 | 270 | 265 | MKP1848e64070+Y* |
| | 50 | 30.0 | 45.0 | 57.5 | 52.5 | 20.3 | 10 | 500 | 21.0 | 23.5 | 3.5 | 3.0 | 270 | 265 | MKP1848e65070+Y* |
| | 70 | 35.0 | 50.0 | 57.5 | 52.5 | 20.3 | 10 | 700 | 27.0 | 31.5 | 2.5 | 2.0 | 270 | 265 | MKP1848e67070+Y* |


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## ELECTRICAL DATA AND ORDERING CODE

| $U_{NDC}$ AT 85 °C (V) | CAP. (µF) | DIMENSION (5) (mm) | | | P1 (mm) | P2 (mm) | du/dt (V/µs) | $I_{PEAK}$ (A) | $I_{RMS}$ (2) (A) | | ESR (3) 10 kHz (mΩ) | | tan δ (4) 10 kHz < (x $10^{-4}$) | | ORDERING CODE (1) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | w | h | l | | | | | 2 PINS | 4 PINS | 2 PINS | 4 PINS | 2 PINS | 4 PINS | |
| 900 | $U_{OPDC}$ AT 105 °C = 700 V; $U_{OPDC}$ AT 125 °C = 500 V | | | | | | | | | | | | | | |
| | 1 | 10.0 | 19.5 | 26.0 | 22.5 | - | 90 | 90 | 4.0 | - | 25.0 | - | 65 | - | MKP1848e51090+I2 |
| | 2 | 12.0 | 22.0 | 26.0 | 22.5 | - | 90 | 180 | 6.0 | - | 15.0 | - | 65 | - | MKP1848e52090+I2 |
| | 3 | 15.5 | 26.5 | 26.5 | 22.5 | - | 90 | 270 | 8.0 | - | 9.0 | - | 65 | - | MKP1848e53090+I2 |
| | 4 | 18 | 29.5 | 26.5 | 22.5 | - | 90 | 360 | 10.0 | - | 7.0 | - | 65 | - | MKP1848e54090+I2 |
| | 1 | 9.0 | 19.0 | 32.0 | 27.5 | - | 50 | 50 | 3.0 | - | 42.0 | - | 75 | - | MKP1848e51090+K2 |
| | 2 | 11.0 | 21.0 | 32.0 | 27.5 | - | 50 | 100 | 4.5 | - | 21.0 | - | 75 | - | MKP1848e52090+K2 |
| | 3 | 15.0 | 25.0 | 32.0 | 27.5 | - | 50 | 150 | 7.0 | - | 14.0 | - | 75 | - | MKP1848e53090+K2 |
| | 4 | 18.0 | 28.0 | 32.0 | 27.5 | - | 50 | 200 | 8.5 | - | 10.5 | - | 75 | - | MKP1848e54090+K2 |
| | 5 | 18.0 | 28.0 | 32.0 | 27.5 | - | 50 | 250 | 9.5 | - | 8.0 | - | 75 | - | MKP1848e55090+K2 |
| | 7 | 21.0 | 31.0 | 32.0 | 27.5 | - | 50 | 350 | 12.5 | - | 6.0 | - | 75 | - | MKP1848e57090+K2 |
| | 10 | 22.0 | 38.0 | 32.0 | 27.5 | - | 50 | 500 | 16.5 | - | 4.0 | - | 75 | - | MKP1848e61090+K2 |
| | 11 | 18.5 | 35.5 | 42.0 | 37.5 | 10.2 | 25 | 275 | 12.0 | 12.5 | 7.0 | 6.5 | 115 | 110 | MKP1848e61190+P* |
| | 15 | 21.5 | 38.5 | 42.0 | 37.5 | 10.2 | 25 | 375 | 14.5 | 16.0 | 5.0 | 4.5 | 115 | 110 | MKP1848e61590+P* |
| | 20 | 24.0 | 44.0 | 42.0 | 37.5 | 10.2 | 25 | 500 | 18.5 | 20.0 | 4.0 | 3.5 | 125 | 120 | MKP1848e62090+P* |
| | 25 | 30.0 | 45.0 | 42.0 | 37.5 | 10.2 / 20.3 | 25 | 625 | 22.0 | 25.0 | 3.0 | 2.5 | 135 | 130 | MKP1848e62590+P* |
| | 35 | 30.0 | 45.0 | 57.5 | 52.5 | 20.3 | 12 | 420 | 20.0 | 23.0 | 4.0 | 3.5 | 200 | 195 | MKP1848e63590+Y* |
| | 45 | 35.0 | 50.0 | 57.5 | 52.5 | 20.3 | 12 | 540 | 25.0 | 27.0 | 3.5 | 3.0 | 200 | 195 | MKP1848e64590+Y* |
| 1000 | $U_{OPDC}$ AT 105 °C = 800 V; $U_{OPDC}$ AT 125 °C = 600 V | | | | | | | | | | | | | | |
| | 1 | 10.0 | 19.5 | 26.0 | 22.5 | - | 95 | 95 | 4.0 | - | 26.0 | - | 55 | - | MKP1848e51010+I2 |
| | 2 | 12.5 | 22.5 | 26.5 | 22.5 | - | 95 | 190 | 6.0 | - | 16.0 | - | 55 | - | MKP1848e52010+I2 |
| | 3 | 15.5 | 26.5 | 26.5 | 22.5 | - | 95 | 285 | 8.0 | - | 10.0 | - | 55 | - | MKP1848e53010+I2 |
| | 4 | 18 | 29.5 | 26.5 | 22.5 | - | 95 | 380 | 10.0 | - | 8.0 | - | 55 | - | MKP1848e54010+I2 |
| | 1 | 11.0 | 21.0 | 32.0 | 27.5 | - | 60 | 60 | 3.5 | - | 39.0 | - | 65 | - | MKP1848e51010+K2 |
| | 2 | 13.0 | 23.0 | 32.0 | 27.5 | - | 60 | 120 | 5.5 | - | 19.5 | - | 65 | - | MKP1848e52010+K2 |
| | 3 | 15.0 | 25.0 | 32.0 | 27.5 | - | 60 | 180 | 7.0 | - | 13.0 | - | 65 | - | MKP1848e53010+K2 |
| | 4 | 18.0 | 28.0 | 32.0 | 27.5 | - | 60 | 240 | 9.0 | - | 9.5 | - | 65 | - | MKP1848e54010+K2 |
| | 6 | 21.0 | 31.0 | 32.0 | 27.5 | - | 60 | 360 | 12.0 | - | 6.5 | - | 65 | - | MKP1848e56010+K2 |
| | 8 | 22.0 | 38.0 | 32.0 | 27.5 | - | 60 | 480 | 15.0 | - | 4.5 | - | 65 | - | MKP1848e58010+K2 |
| | 9 | 18.5 | 35.5 | 42.0 | 37.5 | 10.2 | 30 | 270 | 11.0 | 11.5 | 8.0 | 7.5 | 90 | 85 | MKP1848e59010+P* |
| | 12 | 21.5 | 38.5 | 42.0 | 37.5 | 10.2 | 30 | 360 | 13.5 | 14.5 | 6.0 | 5.5 | 90 | 85 | MKP1848e61210+P* |
| | 15 | 24.0 | 44.0 | 42.0 | 37.5 | 10.2 | 30 | 450 | 16.5 | 17.5 | 5.0 | 4.5 | 110 | 105 | MKP1848e61510+P* |
| | 20 | 30.0 | 45.0 | 42.0 | 37.5 | 10.2 / 20.3 | 30 | 600 | 20.0 | 23.0 | 3.5 | 3.0 | 120 | 115 | MKP1848e62010+P* |
| | 25 | 25.0 | 45.0 | 57.5 | 52.5 | 10.2 | 15 | 375 | 16.5 | 17.5 | 6.0 | 5.5 | 175 | 170 | MKP1848e62510+Y* |
| | 30 | 30.0 | 45.0 | 57.5 | 52.5 | 20.3 | 15 | 450 | 19.0 | 20.0 | 5.0 | 4.5 | 175 | 170 | MKP1848e63010+Y* |
| | 35 | 35.0 | 50.0 | 57.5 | 52.5 | 20.3 | 15 | 525 | 22.0 | 25.0 | 4.0 | 3.5 | 175 | 170 | MKP1848e63510+Y* |


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## ELECTRICAL DATA AND ORDERING CODE

| $U_{NDC}$ AT 85 °C (V) | CAP. (µF) | DIMENSION (5) (mm) | | | P1 (mm) | P2 (mm) | du/dt (V/µs) | $I_{PEAK}$ (A) | $I_{RMS}$ (2) (A) | | ESR (3) 10 kHz (mΩ) | | tan δ (4) 10 kHz < (x $10^{-4}$) | | ORDERING CODE (1) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | w | h | l | | | | | 2 PINS | 4 PINS | 2 PINS | 4 PINS | 2 PINS | 4 PINS | |
| 1200 | $U_{OPDC}$ AT 105 °C = 900 V; $U_{OPDC}$ AT 125 °C = 700 V | | | | | | | | | | | | | | |
| | 1 | 12.0 | 22.0 | 26.0 | 22.5 | - | 125 | 125 | 5.0 | - | 22.0 | - | 50 | - | MKP1848e51012+I2 |
| | 2 | 15.5 | 26.5 | 26.5 | 22.5 | - | 125 | 250 | 8.0 | - | 12.0 | - | 50 | - | MKP1848e52012+I2 |
| | 3 | 18 | 29.5 | 26.5 | 22.5 | - | 125 | 375 | 9.5 | - | 8.0 | - | 50 | - | MKP1848e53012+I2 |
| | 1 | 11.0 | 21.0 | 32.0 | 27.5 | - | 70 | 70 | 4.0 | - | 32.0 | - | 55 | - | MKP1848e51012+K2 |
| | 2 | 15.0 | 25.0 | 32.0 | 27.5 | - | 70 | 140 | 6.5 | - | 16.0 | - | 55 | - | MKP1848e52012+K2 |
| | 3 | 21.0 | 31.0 | 32.0 | 27.5 | - | 70 | 210 | 9.5 | - | 10.5 | - | 55 | - | MKP1848e53012+K2 |
| | 4 | 21.0 | 31.0 | 32.0 | 27.5 | - | 70 | 280 | 10.5 | - | 8.0 | - | 55 | - | MKP1848e54012+K2 |
| | 5 | 22.0 | 38.0 | 32.0 | 27.5 | - | 70 | 350 | 13.0 | - | 6.0 | - | 55 | - | MKP1848e55012+K2 |
| | 6 | 18.5 | 35.5 | 42.0 | 37.5 | 10.2 | 35 | 210 | 9.5 | 10.0 | 11.0 | 10.0 | 80 | 75 | MKP1848e56012+P* |
| | 7 | 21.5 | 38.5 | 42.0 | 37.5 | 10.2 | 35 | 245 | 11.0 | 11.5 | 9.0 | 8.5 | 80 | 75 | MKP1848e57012+P* |
| | 10 | 24.0 | 44.0 | 42.0 | 37.5 | 10.2 | 35 | 350 | 14.5 | 15.0 | 6.5 | 6.0 | 90 | 85 | MKP1848e61012+P* |
| | 12 | 30.0 | 45.0 | 42.0 | 37.5 | 10.2 / 20.3 | 35 | 420 | 17.0 | 18.0 | 5.5 | 5.0 | 100 | 95 | MKP1848e61212+P* |
| | 15 | 25.0 | 45.0 | 57.5 | 52.5 | 10.2 | 15 | 225 | 13.0 | 14.0 | 9.0 | 8.5 | 165 | 160 | MKP1848e61512+Y* |
| | 18 | 30.0 | 45.0 | 57.5 | 52.5 | 20.3 | 15 | 270 | 15.0 | 16.0 | 7.5 | 7.0 | 165 | 160 | MKP1848e61812+Y* |
| | 25 | 35.0 | 50.0 | 57.5 | 52.5 | 20.3 | 15 | 375 | 19.5 | 20.5 | 5.5 | 5.0 | 165 | 160 | MKP1848e62512+Y* |
| 1300 | $U_{OPDC}$ AT 105 °C = 950 V; $U_{OPDC}$ AT 125 °C = 800 V | | | | | | | | | | | | | | |
| | 1 | 12.5 | 22.5 | 26.5 | 22.5 | - | 135 | 135 | 5.5 | - | 17.5 | - | 40 | - | MKP1848e51013+I2 |
| | 2 | 18 | 29.5 | 26.5 | 22.5 | - | 135 | 270 | 9.5 | - | 9.0 | - | 40 | - | MKP1848e52013+I2 |
| | 1 | 11.0 | 21.0 | 32.0 | 27.5 | - | 85 | 85 | 4.5 | - | 24.0 | - | 45 | - | MKP1848e51013+K2 |
| | 2 | 18.0 | 28.0 | 32.0 | 27.5 | - | 85 | 170 | 7.5 | - | 14.0 | - | 45 | - | MKP1848e52013+K2 |
| | 3 | 21.0 | 31.0 | 32.0 | 27.5 | - | 85 | 255 | 10.0 | - | 9.5 | - | 45 | - | MKP1848e53013+K2 |
| | 4 | 22.0 | 38.0 | 32.0 | 27.5 | - | 85 | 340 | 12.5 | - | 7.0 | - | 45 | - | MKP1848e54013+K2 |
| | 5 | 22.0 | 38.0 | 32.0 | 27.5 | - | 85 | 425 | 14.0 | - | 5.5 | - | 45 | - | MKP1848e55013+K2 |
| | 6 | 21.5 | 38.5 | 42.0 | 37.5 | 10.2 | 40 | 240 | 10.5 | 11.0 | 10.5 | 9.5 | 80 | 75 | MKP1848e56013+P* |
| | 9 | 24.0 | 44.0 | 42.0 | 37.5 | 10.2 | 40 | 360 | 13.5 | 14.0 | 7.5 | 6.5 | 80 | 75 | MKP1848e59013+P* |
| | 12 | 30.0 | 45.0 | 42.0 | 37.5 | 10.2 / 20.3 | 40 | 480 | 16.5 | 18.0 | 5.5 | 5.0 | 80 | 75 | MKP1848e61213+P* |
| | 15 | 30.0 | 45.0 | 57.5 | 52.5 | 20.3 | 15 | 225 | 15.5 | 16.0 | 7.5 | 6.5 | 150 | 145 | MKP1848e61513+Y* |
| | 18 | 35.0 | 50.0 | 57.5 | 52.5 | 20.3 | 15 | 270 | 18.0 | 19.5 | 5.5 | 5.5 | 150 | 145 | MKP1848e61813+Y* |
| | 22 | 35.0 | 50.0 | 57.5 | 52.5 | 20.3 | 15 | 330 | 20.0 | 22.0 | 4.5 | 4.5 | 150 | 145 | MKP1848e62213+Y* |

**Notes**

(1) Change the "*" symbol with special code for the terminals and "+" for tolerance, please consult section "Composition of Catalog Number"
(2) Maximum RMS current at 10 kHz, +85 °C, Δt = +15 °C, capacitance tolerance ± 5 %, a typical ESR value at 10 kHz
(3) Equivalent series resistance typical values at f = 10 kHz, ambient temperature. For other frequencies consult charts
(4) Maximum tan δ values
(5) Standard case dimensions, for maximum and minimum dimension please consult section "Dimensions Tolerances"


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## PACKAGING INFORMATION

| $U_{NDC}$ AT 85 °C (V) | CAP. (1) (µF) | DIMENSION (mm) | | | P1 (mm) | P2 (mm) | Ø dt (mm) | ORDERING CODE (2) | MASS (g) | SPQ (3) (pcs) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | w | h | l | | | | | | |
| 500 | $U_{OPDC}$ AT 105 °C = 350 V; $U_{OPDC}$ AT 125 °C = 250 V | | | | | | | | | |
| | 1 | 7.0 | 16.5 | 26.0 | 22.5 | - | 0.8 | MKP1848e51050+I2 | 4.8 | 200 |
| | 2 | 8.5 | 18.0 | 26.0 | 22.5 | - | 0.8 | MKP1848e52050+I2 | 5.8 | 200 |
| | 3 | 10.0 | 19.5 | 26.0 | 22.5 | - | 0.8 | MKP1848e53050+I2 | 6.4 | 200 |
| | 4 | 10.0 | 19.5 | 26.0 | 22.5 | - | 0.8 | MKP1848e54050+I2 | 6.8 | 200 |
| | 6 | 12.0 | 22.0 | 26.0 | 22.5 | - | 0.8 | MKP1848e56050+I2 | 7.8 | 150 |
| | 9 | 15.5 | 26.5 | 26.5 | 22.5 | - | 0.8 | MKP1848e59050+I2 | 14.0 | 110 |
| | 12 | 18.0 | 29.5 | 26.5 | 22.5 | - | 0.8 | MKP1848e61250+I2 | 18.0 | 90 |
| | 15 | 18.0 | 29.5 | 26.5 | 22.5 | - | 0.8 | MKP1848e61550+I2 | 18.0 | 90 |
| | 6 | 11.0 | 21.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e56050+K2 | 9 | 130 |
| | 9 | 13.0 | 23.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e59050+K2 | 11 | 115 |
| | 12 | 15.0 | 25.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e61250+K2 | 12.5 | 100 |
| | 15 | 18.0 | 28.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e61550+K2 | 17.5 | 80 |
| | 22 | 21.0 | 31.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e62250+K2 | 23 | 65 |
| | 30 | 22.0 | 38.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e63050+K2 | 30 | 60 |
| | 35 | 18.5 | 35.5 | 42.0 | 37.5 | 10.2 | 1.0 | MKP1848e63550+P* | 31 | 105 |
| | 45 | 21.5 | 38.5 | 42.0 | 37.5 | 10.2 | 1.0 | MKP1848e64550+P* | 38.5 | 91 |
| | 60 | 24.0 | 44.0 | 42.0 | 37.5 | 10.2 | 1.0 | MKP1848e66050+P* | 50.5 | 77 |
| | 80 | 30.0 | 45.0 | 42.0 | 37.5 | 10.2 / 20.3 | 1.0 | MKP1848e68050+P* | 61.5 | 63 |
| | 90 | 25.0 | 45.0 | 57.5 | 52.5 | 10.2 | 1.2 | MKP1848e69050+Y* | 72 | 55 |
| | 110 | 30.0 | 45.0 | 57.5 | 52.5 | 20.3 | 1.2 | MKP1848e71150+Y* | 84.5 | 45 |
| | 140 | 35.0 | 50.0 | 57.5 | 52.5 | 20.3 | 1.2 | MKP1848e71450+Y* | 110.5 | 40 |
| 700 | $U_{OPDC}$ AT 105 °C = 500 V; $U_{OPDC}$ AT 125 °C = 400 V | | | | | | | | | |
| | 1 | 10.0 | 19.5 | 26.0 | 22.5 | - | 0.8 | MKP1848e51070+I2 | 6.8 | 200 |
| | 2 | 10.0 | 19.5 | 26.0 | 22.5 | - | 0.8 | MKP1848e52070+I2 | 6.8 | 200 |
| | 3 | 12.0 | 22.0 | 26.0 | 22.5 | - | 0.8 | MKP1848e53070+I2 | 7.8 | 150 |
| | 4 | 15.5 | 26.5 | 26.5 | 22.5 | - | 0.8 | MKP1848e54070+I2 | 14.0 | 110 |
| | 5 | 18.0 | 29.5 | 26.5 | 22.5 | - | 0.8 | MKP1848e55070+I2 | 15.5 | 90 |
| | 2 | 9.0 | 19.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e52070+K2 | 7 | 160 |
| | 3 | 11.0 | 21.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e53070+K2 | 9 | 130 |
| | 4 | 13.0 | 23.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e54070+K2 | 11 | 115 |
| | 5 | 15.0 | 25.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e55070+K2 | 13 | 100 |
| | 7 | 18.0 | 28.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e57070+K2 | 18 | 80 |
| | 10 | 21.0 | 31.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e61070+K2 | 23 | 65 |
| | 15 | 22.0 | 38.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e61570+K2 | 30 | 60 |
| | 16 | 18.5 | 35.5 | 42.0 | 37.5 | 10.2 | 1.0 | MKP1848e61570+P* | 32 | 105 |
| | 20 | 21.5 | 38.5 | 42.0 | 37.5 | 10.2 | 1.0 | MKP1848e62070+P* | 40 | 91 |
| | 25 | 24.0 | 44.0 | 42.0 | 37.5 | 10.2 | 1.0 | MKP1848e62570+P* | 52 | 77 |
| | 35 | 30.0 | 45.0 | 42.0 | 37.5 | 10.2 / 20.3 | 1.0 | MKP1848e63570+P* | 64 | 63 |
| | 40 | 25.0 | 45.0 | 57.5 | 52.5 | 10.2 | 1.2 | MKP1848e64070+Y* | 74 | 55 |
| | 50 | 30.0 | 45.0 | 57.5 | 52.5 | 20.3 | 1.2 | MKP1848e65070+Y* | 86 | 45 |
| | 70 | 35.0 | 50.0 | 57.5 | 52.5 | 20.3 | 1.2 | MKP1848e67070+Y* | 110 | 40 |


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## PACKAGING INFORMATION

| $U_{NDC}$ AT 85 °C (V) | CAP. (1) (µF) | DIMENSION (mm) | | | P1 (mm) | P2 (mm) | Ø dt (mm) | ORDERING CODE (2) | MASS (g) | SPQ (3) (pcs) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | w | h | l | | | | | | |
| 900 | $U_{OPDC}$ AT 105 °C = 700 V; $U_{OPDC}$ AT 125 °C = 500 V | | | | | | | | | |
| | 1 | 10.0 | 19.5 | 26.5 | 22.5 | - | 0.8 | MKP1848e51090+I2 | 6.8 | 200 |
| | 2 | 12.0 | 22.0 | 26.0 | 22.5 | - | 0.8 | MKP1848e52090+I2 | 7.8 | 150 |
| | 3 | 15.5 | 26.5 | 26.5 | 22.5 | - | 0.8 | MKP1848e53090+I2 | 14.0 | 110 |
| | 4 | 18.0 | 29.5 | 26.5 | 22.5 | - | 0.8 | MKP1848e54090+I2 | 20.5 | 90 |
| | 1 | 9.0 | 19.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e51090+K2 | 6 | 160 |
| | 2 | 11.0 | 21.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e52090+K2 | 9 | 130 |
| | 3 | 15.0 | 25.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e53090+K2 | 13 | 100 |
| | 4 | 18.0 | 28.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e54090+K2 | 18 | 80 |
| | 5 | 18.0 | 28.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e55090+K2 | 18 | 80 |
| | 7 | 21.0 | 31.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e57090+K2 | 23 | 65 |
| | 10 | 22.0 | 38.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e61090+K2 | 30 | 60 |
| | 11 | 18.5 | 35.5 | 42.0 | 37.5 | 10.2 | 1.0 | MKP1848e61190+P* | 32 | 105 |
| | 15 | 21.5 | 38.5 | 42.0 | 37.5 | 10.2 | 1.0 | MKP1848e61590+P* | 39 | 91 |
| | 20 | 24.0 | 44.0 | 42.0 | 37.5 | 10.2 | 1.0 | MKP1848e62090+P* | 51 | 77 |
| | 25 | 30.0 | 45.0 | 42.0 | 37.5 | 10.2 / 20.3 | 1.0 | MKP1848e62590+P* | 63 | 63 |
| | 35 | 30.0 | 45.0 | 57.5 | 52.5 | 20.3 | 1.2 | MKP1848e63590+Y* | 86 | 45 |
| | 45 | 35.0 | 50.0 | 57.5 | 52.5 | 20.3 | 1.2 | MKP1848e64590+Y* | 111 | 40 |
| 1000 | $U_{OPDC}$ AT 105 °C = 800 V; $U_{OPDC}$ AT 125 °C = 600 V | | | | | | | | | |
| | 1 | 10.0 | 19.5 | 26.5 | 22.5 | - | 0.8 | MKP1848e51010+I2 | 6.8 | 200 |
| | 2 | 12.0 | 22.0 | 26.0 | 22.5 | - | 0.8 | MKP1848e52010+I2 | 7.8 | 150 |
| | 3 | 15.5 | 26.5 | 26.5 | 22.5 | - | 0.8 | MKP1848e53010+I2 | 14.0 | 110 |
| | 4 | 18.0 | 29.5 | 26.5 | 22.5 | - | 0.8 | MKP1848e54010+I2 | 20.5 | 90 |
| | 1 | 11.0 | 21.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e51010+K2 | 9.5 | 130 |
| | 2 | 13.0 | 23.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e52010+K2 | 11 | 115 |
| | 3 | 15.0 | 25.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e53010+K2 | 12.5 | 100 |
| | 4 | 18.0 | 28.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e54010+K2 | 17 | 80 |
| | 6 | 21.0 | 31.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e56010+K2 | 23 | 65 |
| | 8 | 22.0 | 38.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e58010+K2 | 29.5 | 60 |
| | 9 | 18.5 | 35.5 | 42.0 | 37.5 | 10.2 | 1.0 | MKP1848e59010+P* | 31.5 | 105 |
| | 12 | 21.5 | 38.5 | 42.0 | 37.5 | 10.2 | 1.0 | MKP1848e61210+P* | 38.5 | 91 |
| | 15 | 24.0 | 44.0 | 42.0 | 37.5 | 10.2 | 1.0 | MKP1848e61510+P* | 51 | 77 |
| | 20 | 30.0 | 45.0 | 42.0 | 37.5 | 10.2 / 20.3 | 1.0 | MKP1848e62010+P* | 62.5 | 63 |
| | 25 | 25.0 | 45.0 | 57.5 | 52.5 | 10.2 | 1.2 | MKP1848e62510+Y* | 71 | 55 |
| | 30 | 30.0 | 45.0 | 57.5 | 52.5 | 20.3 | 1.2 | MKP1848e63010+Y* | 83.5 | 45 |
| | 35 | 35.0 | 50.0 | 57.5 | 52.5 | 20.3 | 1.2 | MKP1848e63510+Y* | 114 | 40 |


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## PACKAGING INFORMATION

| $U_{NDC}$ AT 85 °C (V) | CAP. (1) (µF) | DIMENSION (mm) | | | P1 (mm) | P2 (mm) | Ø dt (mm) | ORDERING CODE (2) | MASS (g) | SPQ (3) (pcs) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | w | h | l | | | | | | |
| 1200 | $U_{OPDC}$ AT 105 °C = 900 V; $U_{OPDC}$ AT 125 °C = 700 V | | | | | | | | | |
| | 1 | 12.0 | 22.0 | 26.0 | 22.5 | - | 0.8 | MKP1848e51012+I2 | 7.8 | 150 |
| | 2 | 18.0 | 29.5 | 26.5 | 22.5 | - | 0.8 | MKP1848e52012+I2 | 20.5 | 90 |
| | 1 | 11.0 | 21.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e51012+K2 | 9 | 130 |
| | 2 | 15.0 | 25.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e52012+K2 | 12.5 | 100 |
| | 3 | 21.0 | 31.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e53012+K2 | 24 | 65 |
| | 4 | 21.0 | 31.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e54012+K2 | 22.5 | 65 |
| | 5 | 22.0 | 38.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e55012+K2 | 30 | 60 |
| | 6 | 18.5 | 35.5 | 42.0 | 37.5 | 10.2 | 1.0 | MKP1848e56012+P* | 31 | 105 |
| | 7 | 21.5 | 38.5 | 42.0 | 37.5 | 10.2 | 1.0 | MKP1848e57012+P* | 39.5 | 91 |
| | 10 | 24.0 | 44.0 | 42.0 | 37.5 | 10.2 | 1.0 | MKP1848e61012+P* | 51 | 77 |
| | 12 | 30.0 | 45.0 | 42.0 | 37.5 | 10.2 / 20.3 | 1.0 | MKP1848e61212+P* | 63.5 | 63 |
| | 15 | 25.0 | 45.0 | 57.5 | 52.5 | 10.2 | 1.2 | MKP1848e61512+Y* | 72 | 55 |
| | 18 | 30.0 | 45.0 | 57.5 | 52.5 | 20.3 | 1.2 | MKP1848e61812+Y* | 85 | 45 |
| | 25 | 35.0 | 50.0 | 57.5 | 52.5 | 20.3 | 1.2 | MKP1848e62512+Y* | 109 | 40 |
| 1300 | $U_{OPDC}$ AT 105 °C = 950 V; $U_{OPDC}$ AT 125 °C = 800 V | | | | | | | | | |
| | 1 | 12.5 | 22.5 | 26.5 | 22.5 | - | 0.8 | MKP1848e51013+I2 | 11.0 | 140 |
| | 2 | 18.0 | 29.5 | 26.5 | 22.5 | - | 0.8 | MKP1848e52013+I2 | 20.5 | 90 |
| | 1 | 11.0 | 21.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e51013+K2 | 8.5 | 130 |
| | 2 | 18.0 | 28.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e52013+K2 | 17.5 | 80 |
| | 3 | 21.0 | 31.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e53013+K2 | 23.5 | 65 |
| | 4 | 22.0 | 38.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e54013+K2 | 30.5 | 60 |
| | 5 | 22.0 | 38.0 | 32.0 | 27.5 | - | 0.8 | MKP1848e55013+K2 | 29 | 60 |
| | 6 | 21.5 | 38.5 | 42.0 | 37.5 | 10.2 | 1.0 | MKP1848e56013+P* | 39.5 | 91 |
| | 9 | 24.0 | 44.0 | 42.0 | 37.5 | 10.2 | 1.0 | MKP1848e59013+P* | 50.5 | 77 |
| | 12 | 30.0 | 45.0 | 42.0 | 37.5 | 10.2 / 20.3 | 1.0 | MKP1848e61213+P* | 62 | 63 |
| | 15 | 30.0 | 45.0 | 57.5 | 52.5 | 20.3 | 1.2 | MKP1848e61513+Y* | 87 | 45 |
| | 18 | 35.0 | 50.0 | 57.5 | 52.5 | 20.3 | 1.2 | MKP1848e61813+Y* | 118.5 | 40 |
| | 22 | 35.0 | 50.0 | 57.5 | 52.5 | 20.3 | 1.2 | MKP1848e62213+Y* | 110.5 | 40 |

**Notes**

(1) Intermediate capacitance values available on request, please contact dc-film@vishay.com

(2) Change the "*" symbol with special code for the terminals, and "+" for tolerance, please consult section "Composition of Catalog Number"

(3) SPQ = Standard Packing Quantity



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## CONSTRUCTION DESCRIPTION

Low inductive wound cell elements of metallized polypropylene film, potted with resin in a flame retardant case.

## SPECIFIC METHOD OF MOUNTING TO WITHSTAND VIBRATION AND SHOCK

The capacitor unit is designed for mounting on a printed circuit board.

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

The capacitors shall be mechanically fixed by the leads and the body clamped.

## DIMENSIONS TOLERANCES

For the maximum and minimum product dimensions use the following tolerances:

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

Pitch = 22.5 mm, $\Delta w = \Delta l = \Delta h = 0.5$ mm
Pitch = 27.5 mm, $\Delta w = \Delta l = \Delta h = 0.7$ mm
Pitch = 37.5 mm, $\Delta w = \Delta l = \Delta h = 0.7$ mm
Pitch = 52.5 mm, $\Delta w = \Delta l = \Delta h = 1.0$ mm

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

Pitch ≤ 22.5 mm, $\Delta w = \Delta l = \Delta h = 1.0$ mm
Pitch = 27.5 mm, $\Delta w = \Delta l = \Delta h = 1.0$ mm
Pitch = 37.5 mm, $\Delta w = \Delta l = \Delta h = 1.0$ mm
Pitch = 52.5 mm, $\Delta w = \Delta l = \Delta h = 1.5$ mm

## SPACE REQUIREMENTS ON PRINTED-CIRCUIT BOARD

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

For the maximum product dimensions including excentricity use the following tolerances:

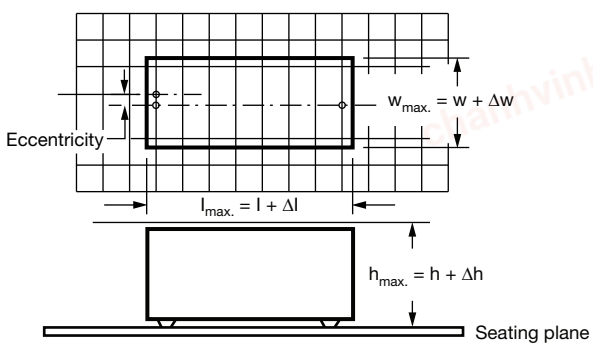
**For 2 pins:**

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

- For products with pitch = 22.5 mm, $\Delta w = \Delta l = \Delta h = 0.5$ mm
- For products with pitch = 27.5 mm, $\Delta w = \Delta l = \Delta h = 0.7$ mm
- For products with pitch = 37.5 mm, $\Delta w = \Delta l = \Delta h = 0.7$ mm
- For products with pitch = 52.5 mm, $\Delta w = \Delta l = \Delta h = 1.0$ mm

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

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





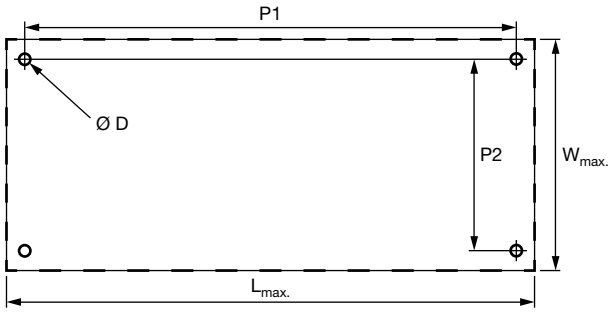

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**For 4 pins:**




| P1 (mm) | $L_{max.}$ (mm) | $W_{max.}$ (mm) | Ø D (mm) | Δh (mm) |
|---|---|---|---|---|
| 37.5 | l + 1.5 | w + 1.8 | 1.5 | h + 0.7 |
| 52.5 | l + 1.8 | w + 2.0 | 1.7 | h + 0.7 |

## SOLDERING CONDITIONS

For general soldering conditions and wave soldering profile we refer to the document “Soldering Guidelines for Film Capacitors”: www.vishay.com/doc?28171

## STORAGE TEMPERATURE

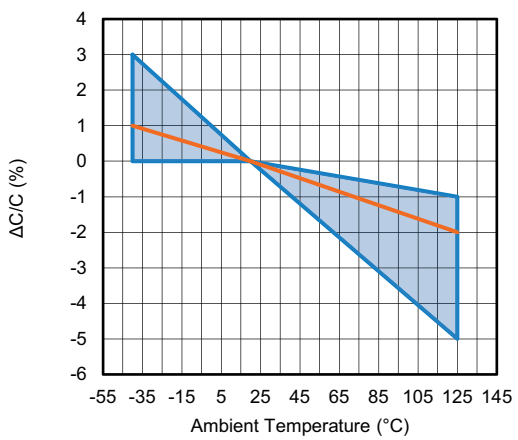
$T_{stg}$ = -25 °C to +35 °C with RH maximum 75 % without condensation.

## RATINGS AND CHARACTERISTICS REFERENCE CONDITIONS

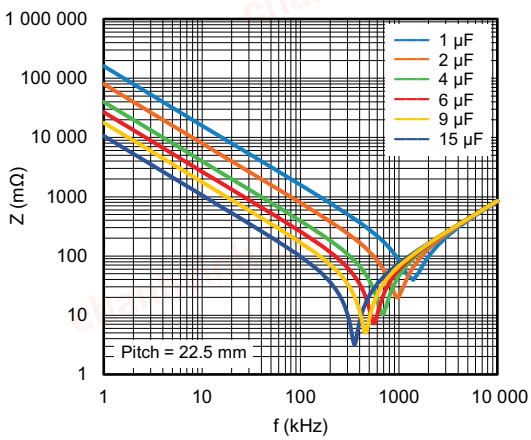
Unless otherwise specified, all electrical values apply to an ambient temperature of 23 °C ± 1 °C, an atmospheric pressure of 86 kPa to 106 kPa, and a relative humidity of 50 % ± 2 %.

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

## CHARACTERISTICS




Capacitance as a function of ambient temperature (typical)




Impedance as a function of frequency (typical)

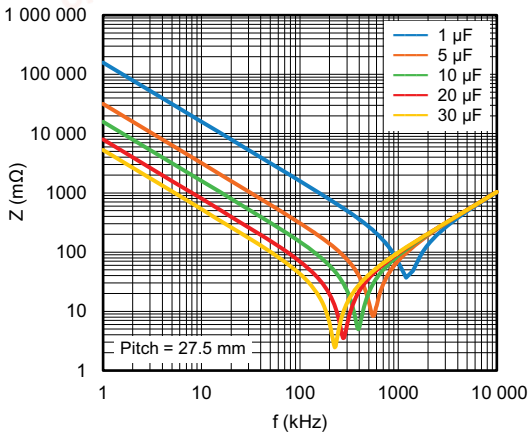


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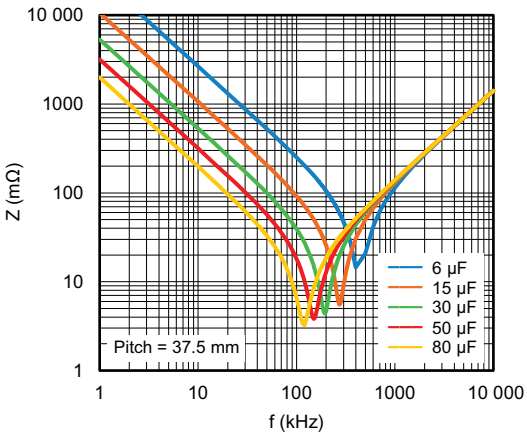
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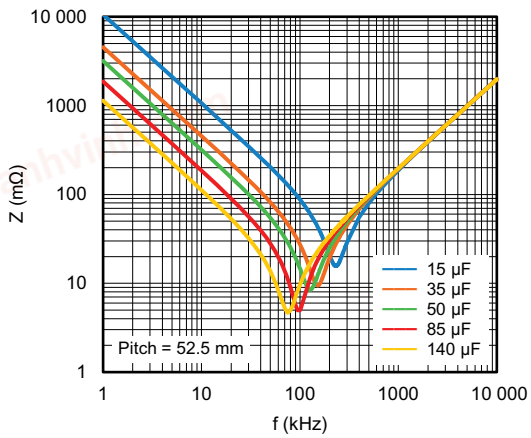




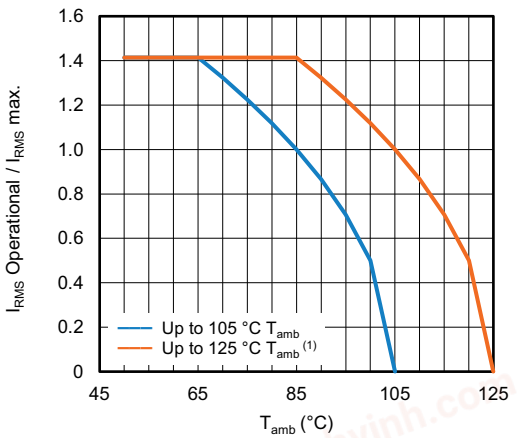

Impedance as a function of frequency (typical)



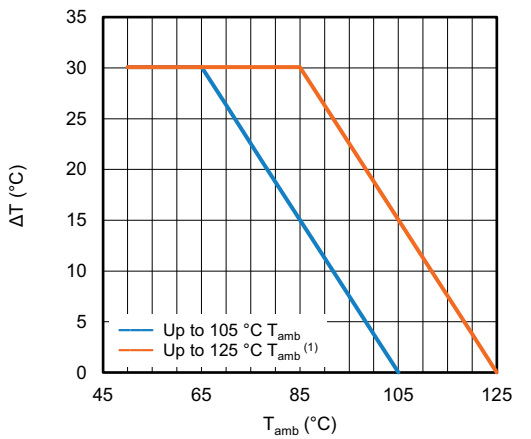

Impedance as a function of frequency (typical)



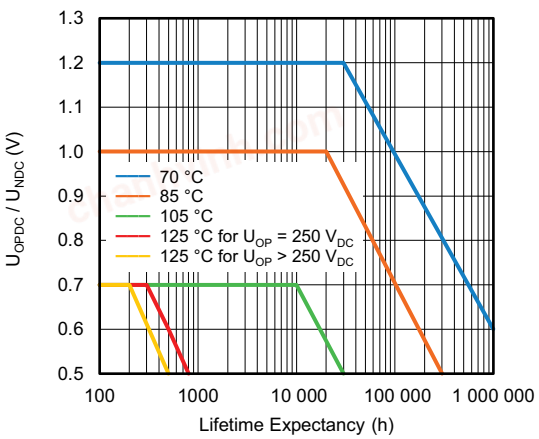

Impedance as a function of frequency (typical)




Maximum $I_{RMS}$ current in function of the ambient temperature (typical curve). Above 85 °C ambient temperature voltage derating must be applicable




Maximum allowed component temperature rise (ΔT) as function of ambient temperature ($T_{amb}$)




Lifetime expectancy (typical)

**Note**

(1) Applicable for a maximum of 500 hours during lifetime

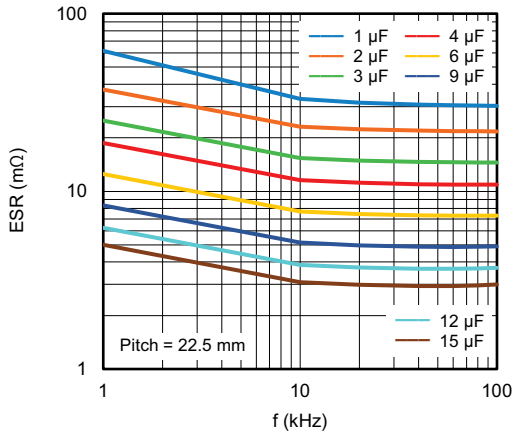


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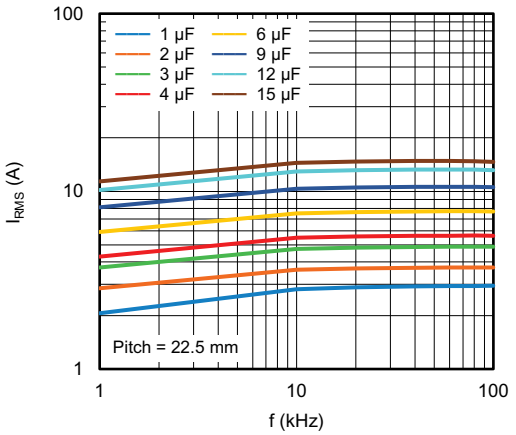
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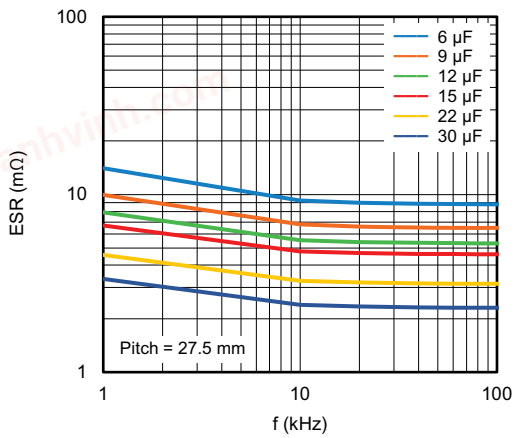
## ESR AND $I_{RMS}$ $U_{NDC}$ 85 °C - 500 V



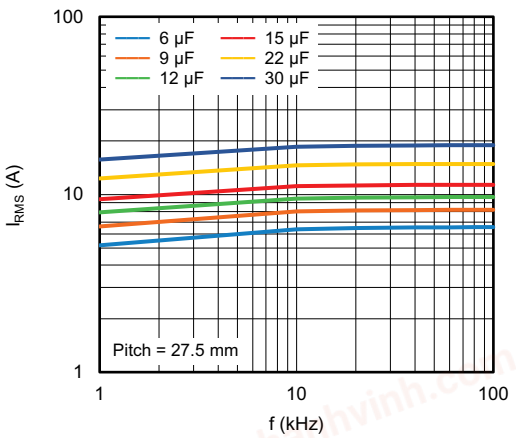

ESR as function of frequency (typical curve)



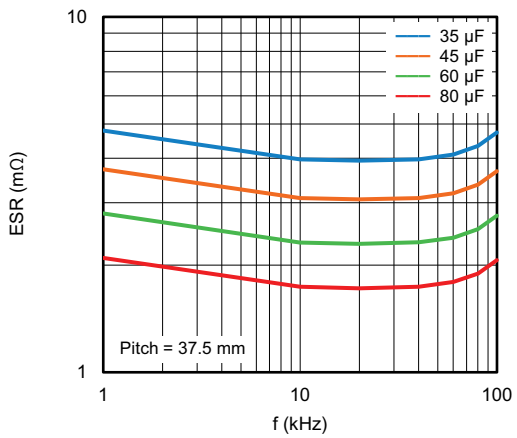

Maximum $I_{RMS}$ current as function of frequency, based $T_A$ + 85 °C, Δt = +15 °C (typical curve)



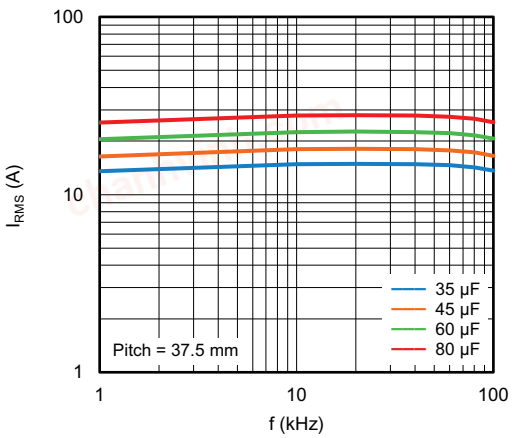

ESR as function of frequency (typical curve)




Maximum $I_{RMS}$ current as function of frequency, based $T_A$ + 85 °C, Δt = +15 °C (typical curve)




ESR as function of frequency (typical curve)

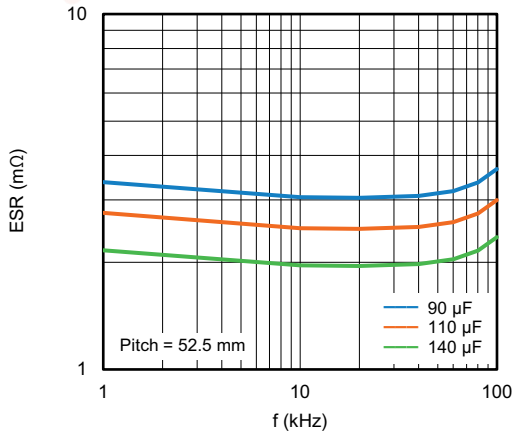



Maximum $I_{RMS}$ current as function of frequency, based $T_A$ + 85 °C, Δt = +15 °C (typical curve)

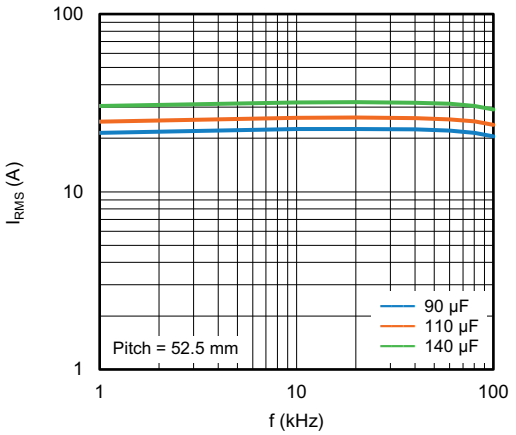

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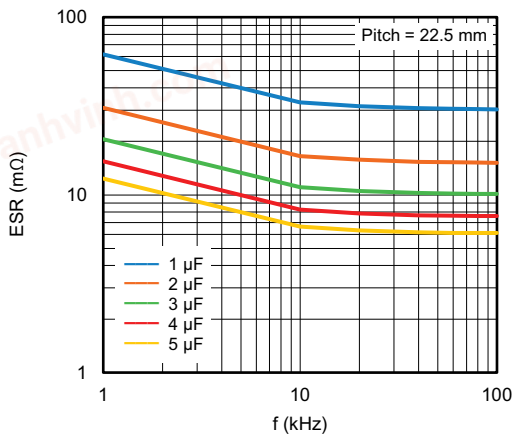



ESR as function of frequency
(typical curve)

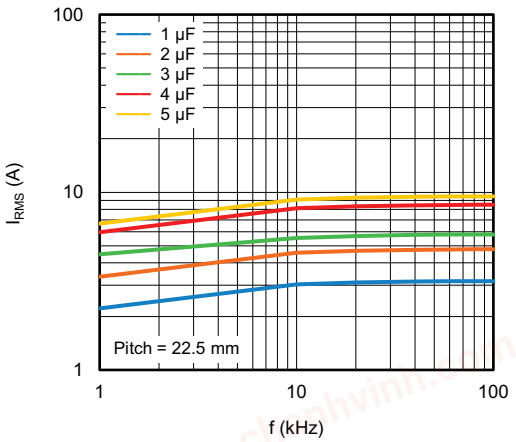



Maximum $I_{RMS}$ current as function of frequency,
based $T_A$ + 85 °C, Δt = +15 °C (typical curve)

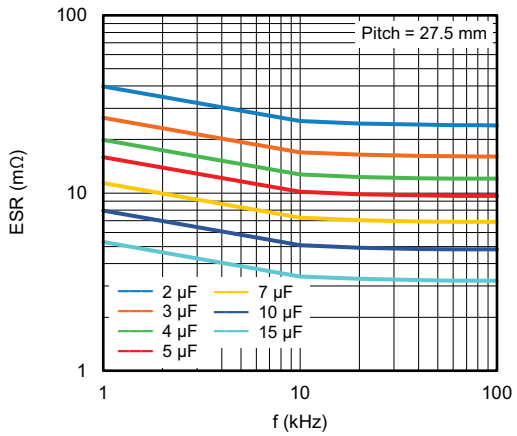
## ESR AND $I_{RMS}$ $U_{NDC}$ 85 °C - 700 V



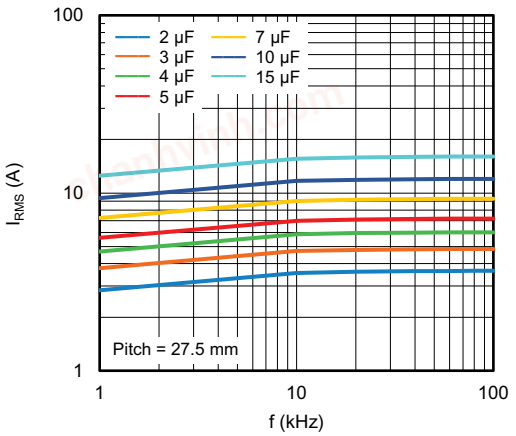

ESR as function of frequency
(typical curve)




Maximum $I_{RMS}$ current as function of frequency,
based $T_A$ + 85 °C, Δt = +15 °C (typical curve)




ESR as function of frequency
(typical curve)

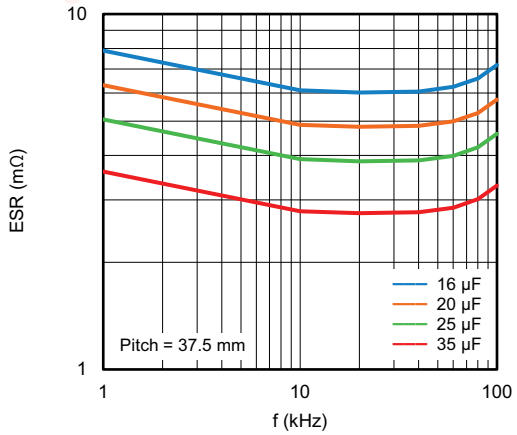



Maximum $I_{RMS}$ current as function of frequency,
based $T_A$ + 85 °C, Δt = +15 °C (typical curve)

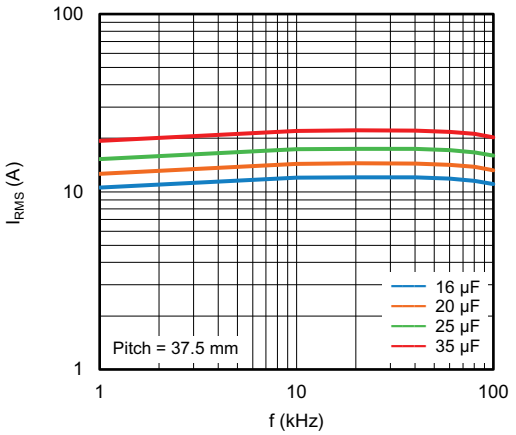

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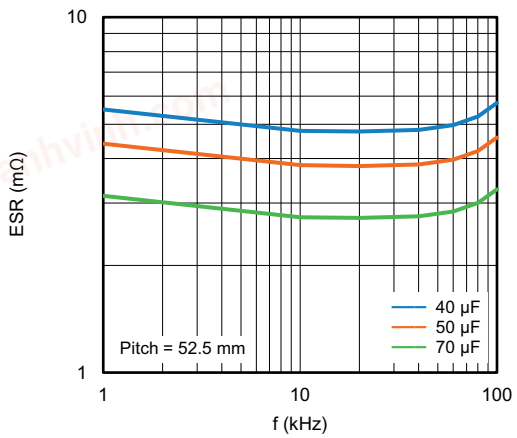




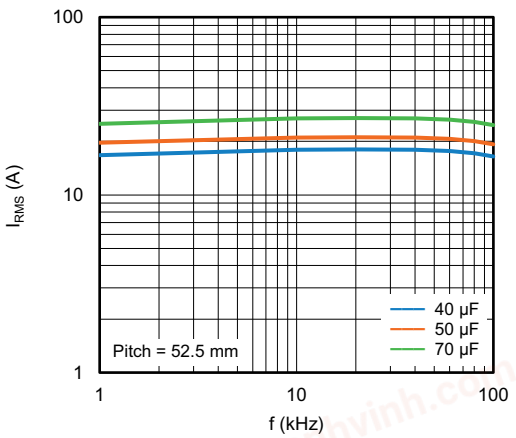

ESR as function of frequency
(typical curve)




Maximum $I_{RMS}$ current as function of frequency,
based $T_A$ + 85 °C, Δt = +15 °C (typical curve)

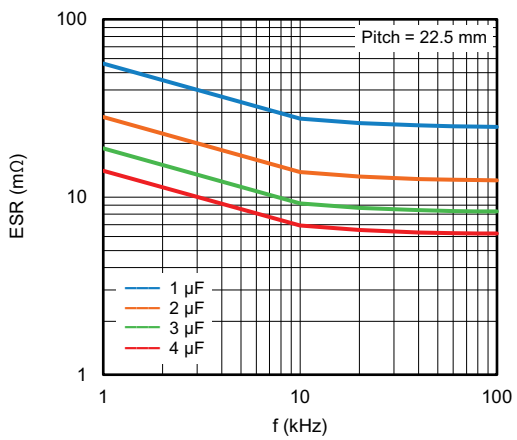



ESR as function of frequency
(typical curve)

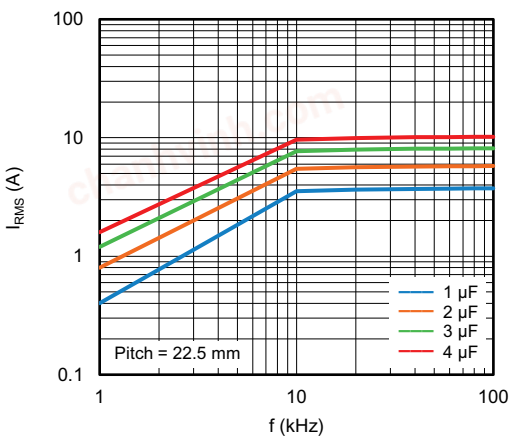



Maximum $I_{RMS}$ current as function of frequency,
based $T_A$ + 85 °C, Δt = +15 °C (typical curve)

## ESR AND $I_{RMS}$ $U_{NDC}$ 85 °C - 900 V




ESR as function of frequency
(typical curve)

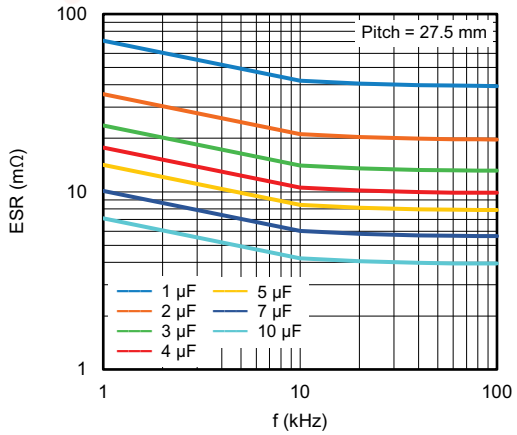



Maximum $I_{RMS}$ current as function of frequency,
based $T_A$ + 85 °C, Δt = +15 °C (typical curve)

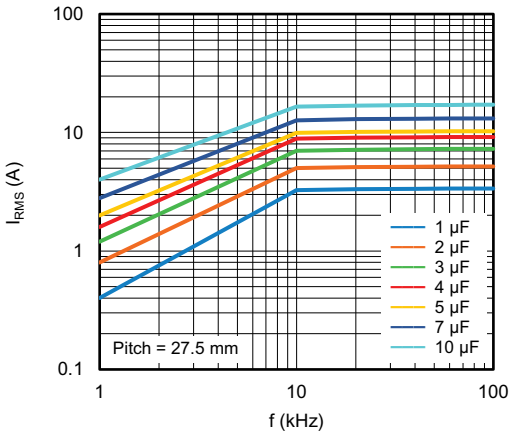

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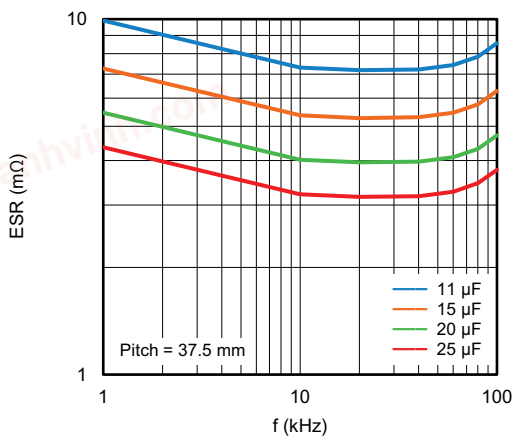




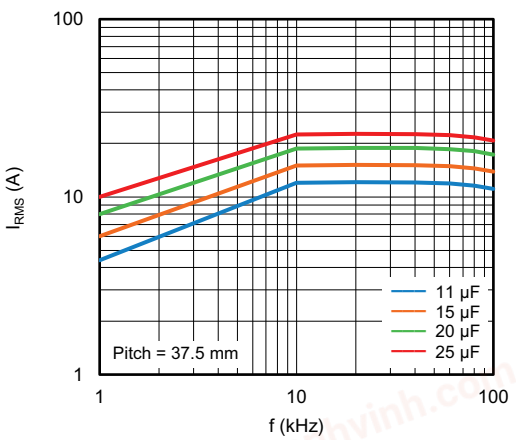

ESR as function of frequency
(typical curve)



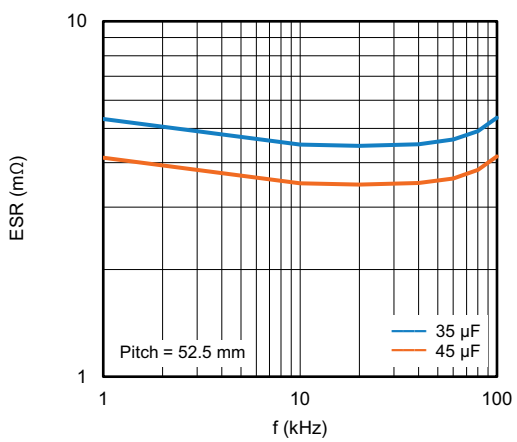

Maximum $I_{RMS}$ current as function of frequency,
based $T_A$ + 85 °C, Δt = +15 °C (typical curve)



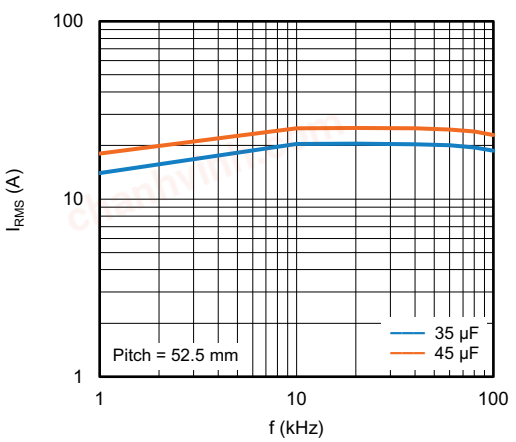

ESR as function of frequency
(typical curve)




Maximum $I_{RMS}$ current as function of frequency,
based $T_A$ + 85 °C, Δt = +15 °C (typical curve)




ESR as function of frequency
(typical curve)



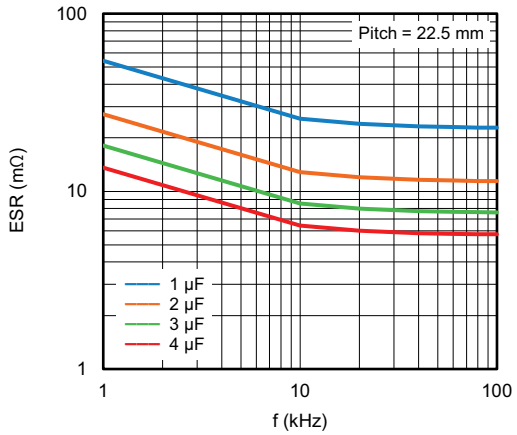

Maximum $I_{RMS}$ current as function of frequency,
based $T_A$ + 85 °C, Δt = +15 °C (typical curve)


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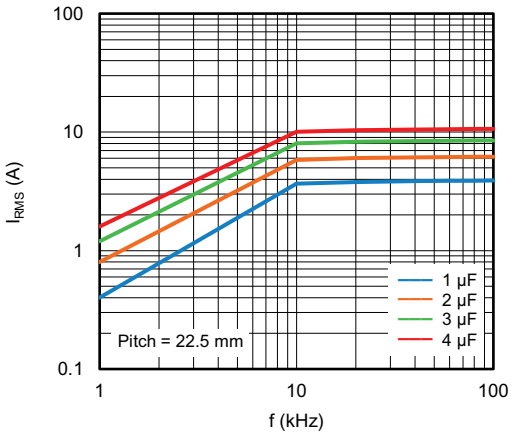
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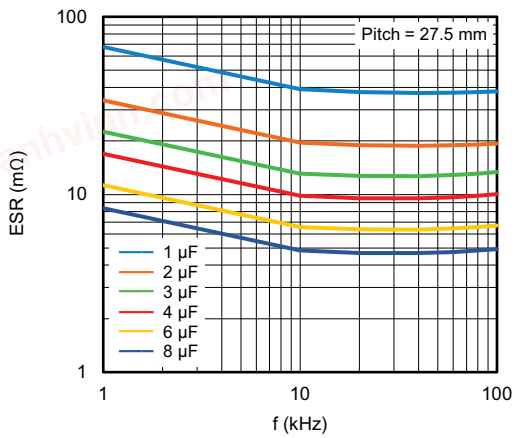
## ESR AND $I_{RMS}$ $U_{NDC}$ 85 °C - 1000 V



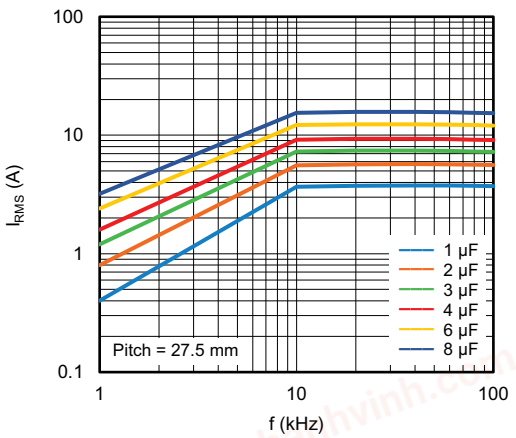

ESR as function of frequency
(typical curve)



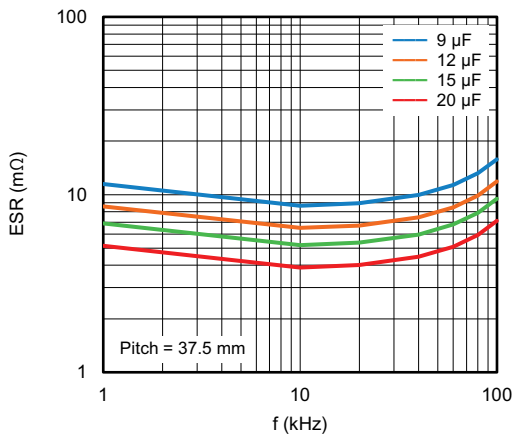

Maximum $I_{RMS}$ current as function of frequency,
based $T_A$ + 85 °C, Δt = +15 °C (typical curve)



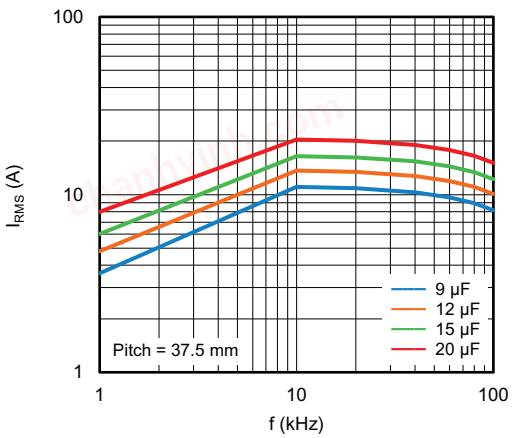

ESR as function of frequency
(typical curve)




Maximum $I_{RMS}$ current as function of frequency,
based $T_A$ + 85 °C, Δt = +15 °C (typical curve)




ESR as function of frequency
(typical curve)

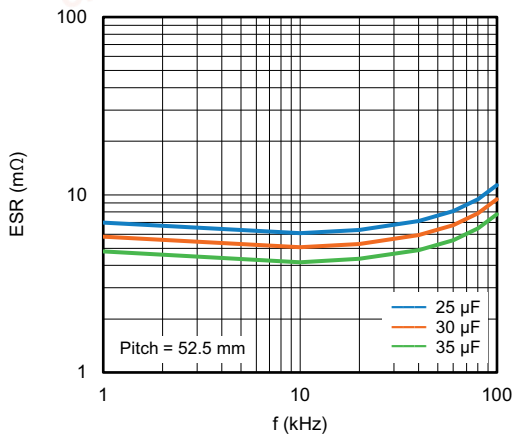



Maximum $I_{RMS}$ current as function of frequency,
based $T_A$ + 85 °C, Δt = +15 °C (typical curve)

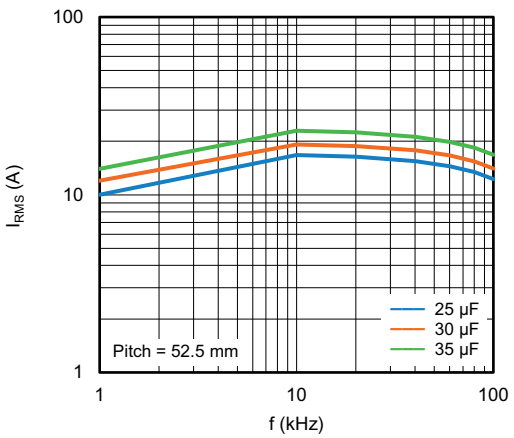

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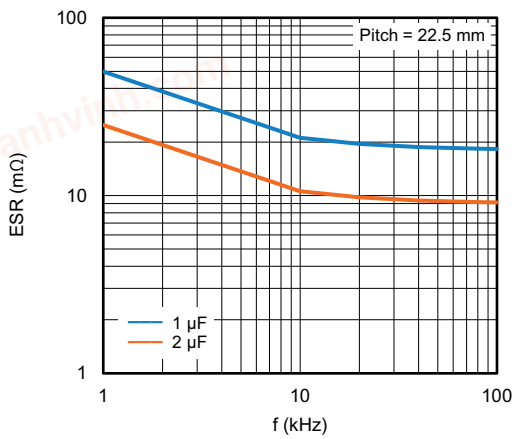



ESR as function of frequency
(typical curve)

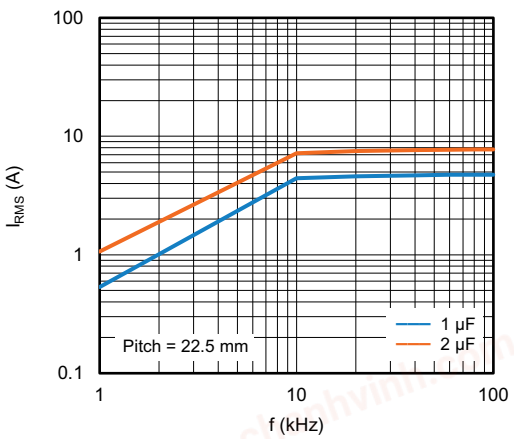



Maximum $I_{RMS}$ current as function of frequency,
based $T_A$ + 85 °C, Δt = +15 °C (typical curve)

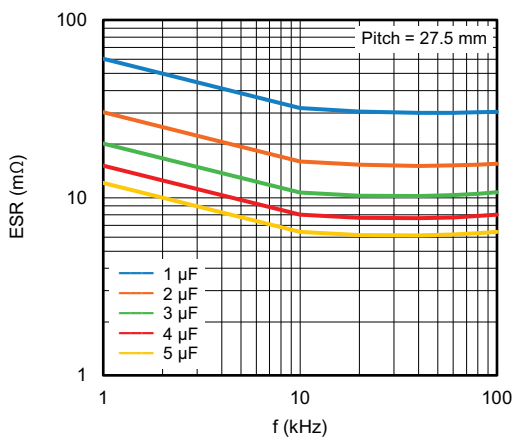
## ESR AND $I_{RMS}$ $U_{NDC}$ 85 °C - 1200 V



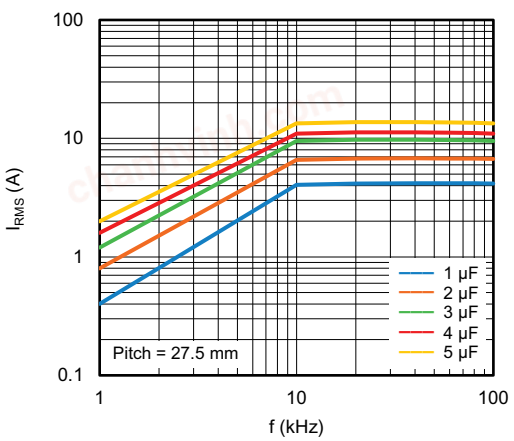

ESR as function of frequency
(typical curve)




Maximum $I_{RMS}$ current as function of frequency,
based $T_A$ + 85 °C, Δt = +15 °C (typical curve)




ESR as function of frequency
(typical curve)

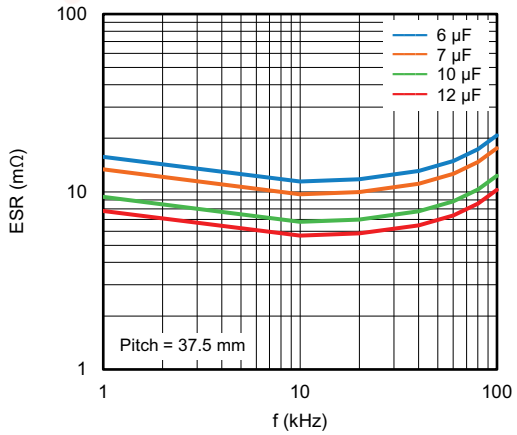



Maximum $I_{RMS}$ current as function of frequency,
based $T_A$ + 85 °C, Δt = +15 °C (typical curve)

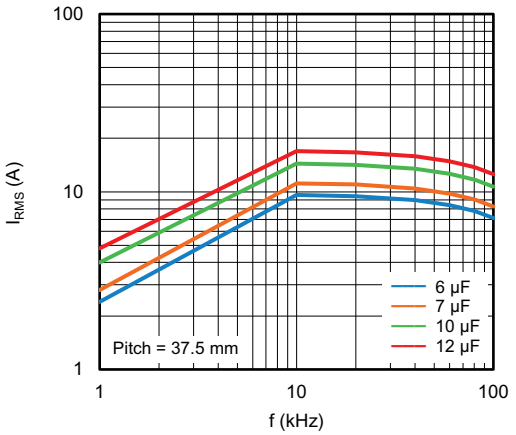

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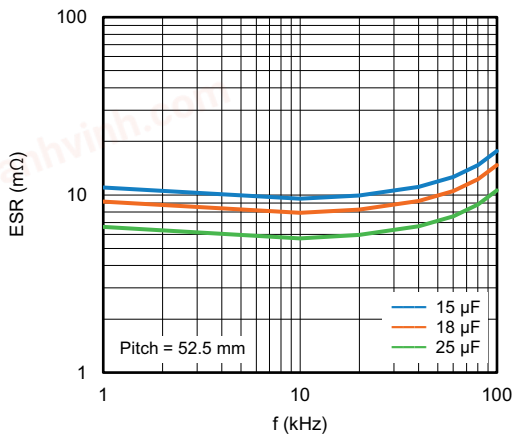




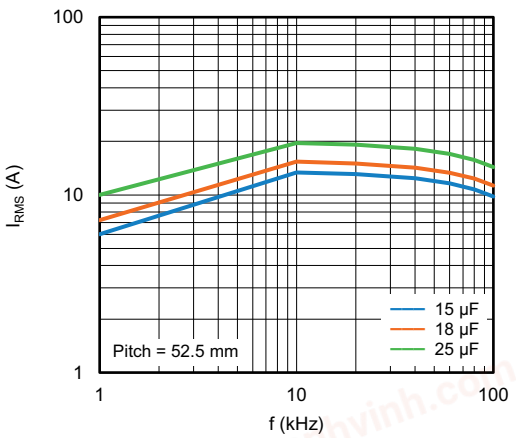

ESR as function of frequency
(typical curve)




Maximum $I_{RMS}$ current as function of frequency,
based $T_A$ + 85 °C, Δt = +15 °C (typical curve)

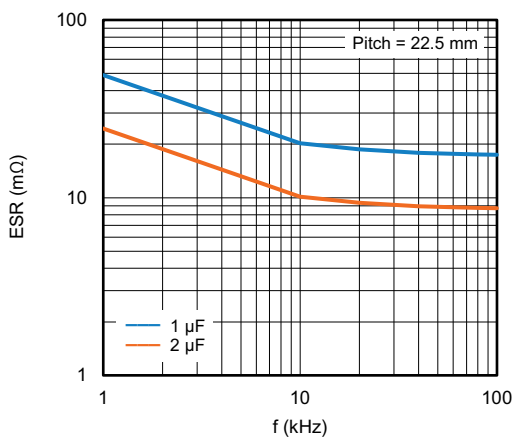



ESR as function of frequency
(typical curve)

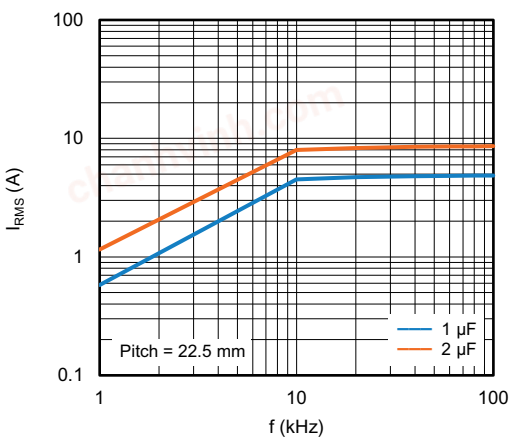



Maximum $I_{RMS}$ current as function of frequency,
based $T_A$ + 85 °C, Δt = +15 °C (typical curve)

## ESR AND $I_{RMS}$ $U_{NDC}$ 85 °C - 1300 V




ESR as function of frequency
(typical curve)

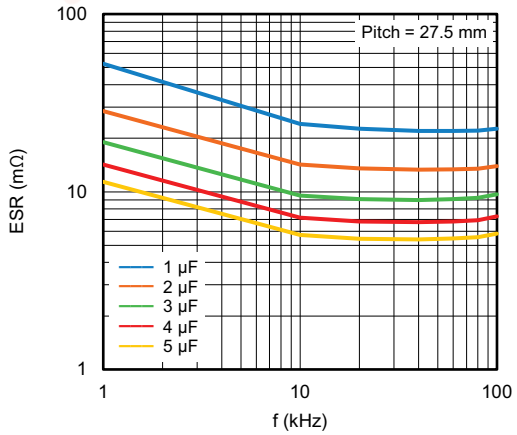



Maximum $I_{RMS}$ current as function of frequency,
based $T_A$ + 85 °C, Δt = +15 °C (typical curve)

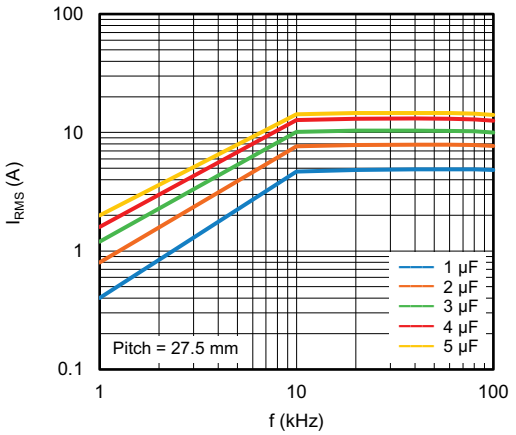

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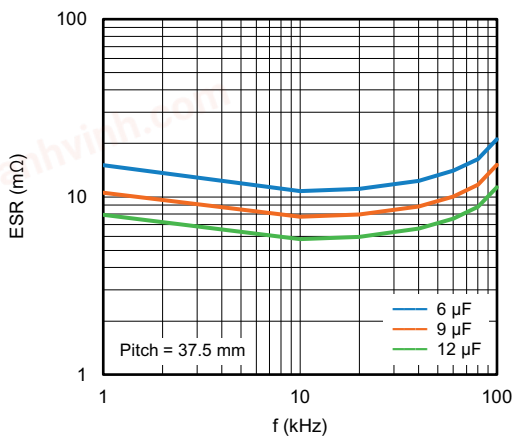




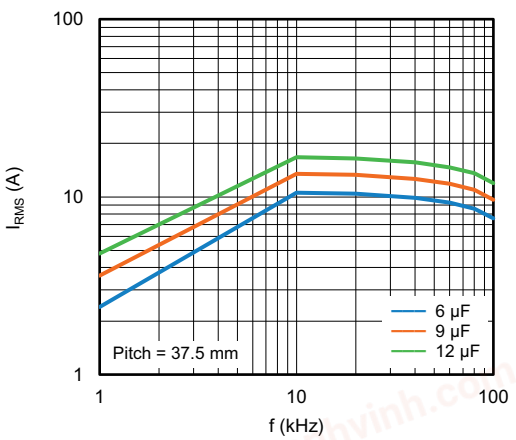

ESR as function of frequency
(typical curve)



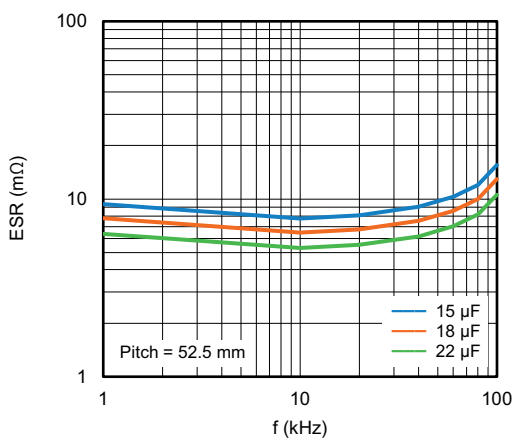

Maximum $I_{RMS}$ current as function of frequency,
based $T_A$ + 85 °C, Δt = +15 °C (typical curve)



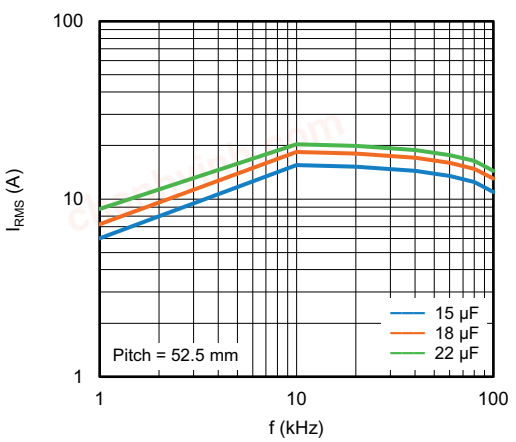

ESR as function of frequency
(typical curve)




Maximum $I_{RMS}$ current as function of frequency,
based $T_A$ + 85 °C, Δt = +15 °C (typical curve)




ESR as function of frequency
(typical curve)




Maximum $I_{RMS}$ current as function of frequency,
based $T_A$ + 85 °C, Δt = +15 °C (typical curve)


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| HEAT CONDUCTIVITY | | | |
|---|---|---|---|
| DIMENSIONS (mm) | | | HEAT CONDUCTIVITY (mW/°C) |
| w | h | l | |
| 6 | 15.5 | 26 | 19 |
| 7 | 16.5 | 26 | 22 |
| 8.5 | 18 | 26 | 25 |
| 10 | 19.5 | 26 | 29 |
| 11 | 21 | 26.5 | 32 |
| 12 | 22 | 26 | 34 |
| 12.5 | 22.5 | 26.5 | 36 |
| 15.5 | 26.5 | 26.5 | 45 |
| 18.5 | 29.5 | 26.5 | 54 |
| 9 | 19 | 32 | 30 |
| 11 | 21 | 32 | 35 |
| 13 | 23 | 32 | 41 |
| 15 | 25 | 32 | 46 |
| 18 | 28 | 32 | 55 |
| 21 | 31 | 32 | 65 |
| 22 | 38 | 32 | 77 |
| 18.5 | 35.5 | 42 | 70 |
| 21.5 | 38.5 | 42 | 80 |
| 24 | 44 | 42 | 94 |
| 30 | 45 | 42 | 108 |
| 25 | 45 | 57.5 | 113 |
| 30 | 45 | 57.5 | 125 |
| 35 | 50 | 57.5 | 146 |

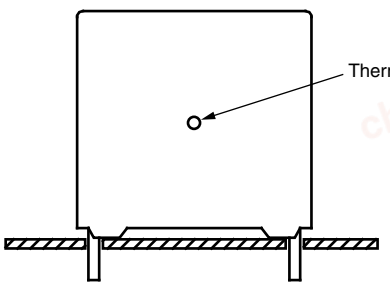
## POWER DISSIPATION AND MAXIMUM COMPONENT TEMPERATURE RISE

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

The component temperature rise ($\Delta T$) can be measured or calculated by $\Delta T = P/G$:

- $\Delta T = T_C - T_{amb}$ = case temperature rise (°C) with a maximum of 15 °C at rated temperature
- $P = I_{RMS}^2 \times ESR$ = power dissipation of the component (mW)
- G = heat conductivity of the component (mW/°C)

## MEASURING THE COMPONENT TEMPERATURE




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

To avoid external thermal radiation or convection, the capacitor must be tested in a closed area, free from air circulation.



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## APPLICATION NOTES AND LIMITING CONDITIONS

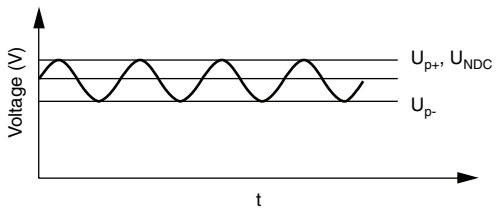
These capacitors are not suitable for mains applications as across-the-line capacitors without additional protection.

These mains applications are strictly regulated in safety standards and therefore electromagnetic interference suppression capacitors conforming the standards must be used.

To select the capacitor for a certain application, the following conditions must be checked:

1. The continuous peak voltage ($U_{P+}$) shall not exceed the DC voltage rating ($U_{NDC}$)
2. The peak-to-peak ripple voltage ($U_{PP}$) shall not be greater than 0.2 x ($U_{NDC}$)

**Non reversing recurrent waveform**




3. For capacitors connected in parallel, normally the proof voltage and possibly the rated voltage must be reduced. For information depending of the capacitance value and the number of parallel connections contact: dc-film@vishay.com
4. The voltage peak slope (du/dt) shall not exceed the pulse slope at the DC voltage rating.

   If the pulse voltage is lower than the rated DC voltage, the rated voltage pulse slope may be multiplied by $U_{NDC}$ and divided by the applied voltage.

   For all other pulses following equation must be fulfilled:

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

   T is the pulse duration

| MAXIMUM REPETITIVE PEAK VOLTAGES | |
|---|---|
| **REPETITIVE SURGE VOLTAGE** | **MAXIMUM DURATION PER DAY** |
| 1.1 x $U_{NDC}$ | 30 % on load duration |
| 1.15 x $U_{NDC}$ | 30 min |
| 1.2 x $U_{NDC}$ | 5 min |
| 1.3 x $U_{NDC}$ | 1 min |
| 1.5 x $U_{NDC}$ | 110 ms |

**Note**

- The capacitor unit may be subjected to the surge above without any significant reduction of lifetime expectancy


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| TEST CONDITIONS AND REQUIREMENTS ACCORDING IEC 61071 | | | | |
|---|---|---|---|---|
| **SUB-CLAUSE NUMBER AND TEST** | | **CONDITIONS** | | **PERFORMANCE REQUIREMENTS** |
| **ROUTINE TEST - FINAL INSPECTION** | | | | |
| 5.14.2-1 | External inspection, visual examination | | | Legible marking as specified |
| 5.14.2-2 | Dimensions | | | See specification drawing |
| 5.3-1 | Capacitance | 1 kHz at room temperature | | See specific reference data |
| 5.3-2 | tan δ | 10 kHz at room temperature | | See specific reference data |
| 5.5.1-2 | DC voltage test between terminals | 1.5 x $U_{NDC}$ at $T_{amb}$<br>Duration: 10 s | | No visible damage or puncture<br>No flashover |
| 5.7 | Insulation resistance | Measuring voltage 500 V at room temperature<br>Duration: 1 min | | See specific reference data |
| **TYPE TESTS** | | | | |
| 5.14.2 | External inspection | Check for finish, marking, and overall dimensions | | Legible marking and finish as specified<br>Dimensions: see specific drawing |
| 5.14.0 | Initial measurements | Capacitance at 1 kHz<br>tan δ at 10 kHz | | |
| 5.14.1-1/4 | Robustness of terminations IEC 60068-2-21 | Tensile Ua1: duration: 10 s ± 1 s | | |
| | | Wire diameter | Section | Load |
| | | d ≤ 0.80 mm | S ≤ 0.5 $mm^2$ | 10 N (± 10 %) |
| | | d ≤ 1.25 mm | S ≤ 1.2 $mm^2$ | 20 N (± 10 %) |
| | | Bending, Ub method 1: 4 x 90 °, duration 2 s to 3 s/bend | | |
| | | Wire diameter | Section | Load |
| | | d ≤ 0.80 mm | $Z_x$ ≤ 0.050 $mm^3$ | 5 N (± 10 %) |
| | | d ≤ 1.25 mm | $Z_x$ ≤ 0.019 $mm^3$ | 10 N (± 10 %) |
| 5.14.1-6 | Resistance to soldering heat IEC 60068-2-20 | No predrying, method 1A<br>Solder bath: 280 °C ± 5 °C<br>Duration: 10 s ± 1 s | | |
| 5.14.4 | Final measurements | Capacitance<br>tan δ | | \|ΔC/C\| ≤ 0.5 %<br>Increase of tan δ ≤ 0.0050<br>Compared to values measured in 5.14.0 |
| 5.14.0 | Initial measurements | Capacitance at 1 kHz<br>tan δ at 10 kHz | | |
| 5.14.3-1 | Vibration IEC 60068-2-6 | 10 Hz to 55 Hz: amplitude ± 0.35 mm or acceleration 98 $m/s^2$<br>Test duration: 10 frequency cycles (3 axes offset from each other by 90°)<br>1 octave/min<br>Visual examination | | No visible damage |
| 5.14.3-2 | Shock or impact IEC 60068-2-6 | Pulse shape: half sine<br>Acceleration: 490 $m/s^2$<br>Duration of pulse: 11 ms | | |
| 5.14.4 | Final measurements | Visual examination<br>Capacitance<br>tan δ | | No visible damage<br>\|ΔC/C\| ≤ 0.5 %<br>Increase of tan δ ≤ 0.0050<br>Compared to values measured in 5.14.0 |


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| TEST CONDITIONS AND REQUIREMENTS ACCORDING IEC 61071 | | |
|---|---|---|
| **SUB-CLAUSE NUMBER AND TEST** | **CONDITIONS** | **PERFORMANCE REQUIREMENTS** |
| **TYPE TESTS** | | |
| 5.5.3-1 Initial measurements | Capacitance at 1 kHz<br>tan δ at 10 kHz<br>Insulation resistance | |
| 5.5.3-2 DC voltage test between terminals | 1.5 x $U_{NDC}$ at $T_{amb}$<br>Duration: 60 s | |
| 5.5.3-3 Final measurements | Capacitance<br>tan δ<br>Insulation resistance | \|ΔC/C\| ≤ 0.5 %<br>Increase of tan δ ≤ 0.0050<br>IR ≥ 50 % of specified values |
| 5.9-1 Initial measurements | Capacitance at 1 kHz<br>tan δ at 10 kHz<br>Insulation resistance | |
| 5.9-2 Surge discharge test | 1.1 x $U_{NDC}$<br>Number of discharges: 5<br>Time lapse: every 2 min (10 min total) | |
| 5.9-2 DC voltage test between terminals | Within 5 min after the surge discharge test<br>1.5 x $U_{NDC}$ at $T_{amb}$<br>Duration: 60 s | |
| 5.9-3 Final measurements | Capacitance<br>tan δ<br><br>Insulation resistance | \|ΔC/C\| ≤ 1.0 %<br>tan δ ≤ 1.2 x initial tan δ + 0.0001<br>Compared to values measured in 5.9-1<br>IR ≥ 50 % of specified values |
| 5.11-1 Initial measurements | Capacitance at 1 kHz<br>tan δ at 10 kHz<br>Insulation resistance | |
| 5.11-2 Self healing test | 1.5 x $U_{NDC}$<br>Duration: 10 s<br>Increase the voltage at 100 V/s till 5 clearings occur or until voltage reach max. of 2.5 x $U_{NDC}$ for a duration of 10 s | Number of clearings ≤ 5<br>Clearing = voltage drop of 5 % |
| 5.11-3 Final measurements | Capacitance<br>tan δ<br><br>Insulation resistance | \|ΔC/C\| ≤ 0.5 %<br>tan δ ≤ 1.2 x initial tan δ + 0.0001<br>Compared to values measured in 5.11-1<br>IR ≥ 50 % of specified values |
| 5.13-0 Initial measurements | Capacitance at 1 kHz<br>tan δ at 10 kHz<br>Insulation resistance | |
| 5.13-1 Change of temperature acc. to IEC 60068-2-14 | Test Nb<br>$T_{max.}$ = +85 °C; $T_{min.}$ = -40 °C<br>Transition time: 1 h, equivalent to 1 °C/min<br>5 cycles | |
| 5.13.2 Damp heat steady state acc. to IEC 60068-2-78 | Test Ca<br>T = 40 °C ± 2 °C; RH = 93 % ± 3 %<br>Duration: 56 days<br><br>1.5 x $U_{NDC}$ at ambient temperature<br>Duration: 60 s | |
| 5.13.3 Final measurements | Visual examination<br><br>Capacitance<br>tan δ<br><br>Insulation resistance | No puncturing or flashover<br>Self-healing punctures are permitted<br><br>\|ΔC/C\| ≤ 2 %<br>increase of tan δ ≤ 0.0150<br>Compared to values measured in 5.13-0<br>IR ≥ 50 % of specified values |


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| TEST CONDITIONS AND REQUIREMENTS ACCORDING IEC 61071 | | |
|---|---|---|
| **SUB-CLAUSE NUMBER AND TEST** | **CONDITIONS** | **PERFORMANCE REQUIREMENTS** |
| **TYPE TEST** | | |
| 5.13A-0 Initial measurements | Capacitance at 1 kHz<br>tan δ at 1 kHz, 10 kHz<br>ESR at 10 kHz<br>Insulation resistance | |
| 5.13A.2 Accelerate damp heat steady state with load | T = 60 °C; RH = 93 % at $U_{NDC}$, duration: 56 days | |
| 5.13.3 Final measurements | Capacitance at 1 kHz<br>tan δ at 1 kHz, 10 kHz<br>ESR at 10 kHz<br><br>Insulation resistance | \|ΔC/C\| < 10 %<br>For the pitch 27.5 mm:<br>increase of tan δ (10 kHz) ≤ 5 x tan δ<br>For the pitch 37.5 mm and 52.5 mm:<br>increase of tan δ (10 kHz) ≤ 2.5 x tan δ<br>Compared to values measured in 5.13A-0<br>IR ≥ 0.1 GΩ or 10 % of specified values (if lower) |
| 5.10-0 Initial measurements | Capacitance at 1 kHz<br>tan δ at 10 kHz<br>Insulation resistance | |
| 5.10-1 Thermal stability test under overload conditions | Natural cooling $T_{amb}$ ± 5 °C<br>1.21 x $P_{max.}$ = 1.21 x ($I^2_{RMS}$ / w x C) x tan δ (f)<br>with w = 2 x π x f<br>for $I_{RMS}$ see specific reference data f = 10 kHz<br>Duration: 48 h<br>Measure the temperature every 1.5 hour during the last 6 hours | Temperature rise < 1 °C |
| 5.10-2 Final measurements | Capacitance<br>tan δ at 10 kHz<br>Insulation resistance | \|ΔC/C\| ≤ 2 %<br>Increase of tan δ ≤ 0.0150<br>IR ≥ 50 % of specified values |
| 5.12 Resonance frequency measurement | Impedance analyzer at $T_{amb}$ | > 0.9 times the value as specified in typical curve “Resonant frequency” of this specification |
| 5.15-0 Initial measurements | Capacitance at 1 kHz<br>tan δ at 10 kHz<br>Insulation resistance | |
| 5.15-1 Endurance test between terminals | Sequence<br>1.3 x $U_{NDC}$ at 85 °C<br>1.3 x $U_{OPDC}$ at 105 °C<br>Duration: 500 h<br><br>1000 x discharge at 1.4 x $\hat{I}$<br>(maximum peak current)<br><br>1.3 x $U_{NDC}$ at 85 °C<br>1.3 x $U_{OPDC}$ at 105 °C<br>Duration: 500 h | |
| 5.15-2 Final measurements | Capacitance<br>tan δ<br><br>Insulation resistance | \|ΔC/C\| ≤ 3 %<br>Increase of tan δ ≤ 0.0150<br>Compared to values measured in 5.15-0<br>IR ≥ 50 % of specified values |


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| TEST CONDITIONS AND REQUIREMENTS ACCORDING IEC 61071 | | |
|---|---|---|
| **SUB-CLAUSE NUMBER AND TEST** | **CONDITIONS** | **PERFORMANCE REQUIREMENTS** |
| 5.16.3-0 Initial measurements | Capacitance at 1 kHz | |
| 5.16.3-1 Destruction test sequence for non-segmented film | The capacitors must be put in an oven at $T_{max.}$ = 85 °C, product enveloped with cheese cloth | |
| High DC voltage test | Apply DC voltage until repetitive product healings occur, duration: 15 min | Audible healings or check healings with oscilloscope |
| High AC voltage test | $AC_{RMS}$ voltage = $U_{NDC}/2\ \sqrt{2}$ with min. 250 $V_{AC}$<br>Duration: 5 min<br><br>Repeat destruction sequence 3 x | |
| 5.16.3-2 Final measurements | Visual examination | No puncturing, flashover or burning of the cheese cloth<br>Self healing punctures are permitted |

**Note**

Measurement conditions at room temperature:

- Capacitance at 1 kHz
- tan δ 1 kHz, 10 kHz
- ESR 10 kHz
- Insulation resistance 500 V, 1 min after full charge

| TEST CONDITIONS AND REQUIREMENTS ACCORDING AEC-Q200 REVISION E | | | | |
|---|---|---|---|---|
| **NO.** | **TEST NAME** | **REFERENCE** | **TEST CONDITIONS** | **PERFORMANCE REQUIREMENTS** |
| 1 | Pre- and post-stress electrical test | Spec. | - | - |
| 3 | High temperature exposure (storage) | MIL-STD 202 method 108 | 105 °C; unpowered<br>250 h / 500 h / 1000 h | $\lvert\Delta C/C\rvert \leq 3$ %<br>Increase of tan δ (10 kHz) ≤ 0.010<br>IR > 50 % of initial specified value |
| 4 | Temperature cycling | JESD22 method JA-104 | 1000 cycles: -40 °C / +105 °C<br>30 min. dwell time at each temperature extreme<br>Transition time < 1 min. | $\lvert\Delta C/C\rvert \leq 2$ %<br>Increase of tan δ (10 kHz) ≤ 0.010<br>IR > 50 % of initial specified value |
| 6 | Moisture resistance | MIL-STD 202 method 106 | 10 cycles at 24 h/cycle unpowered | $\lvert\Delta C/C\rvert \leq 2$ %<br>Increase of tan δ (10 kHz) ≤ 0.010<br>IR > 50 % of initial specified value |
| 7 | Biased humidity | MIL-STD 202 method 103 | 40 °C; 93 % RH; $U_{NDC}$<br>250 h / 500 h / 1000 h | $\lvert\Delta C/C\rvert \leq 2$ %<br>Increase of tan δ (10 kHz) ≤ 0.010<br>IR > 50 % of initial specified value |
| 8 | Operational life | MIL-STD 202 method 108 | $T_{amb}$ = 105 °C; 1.0 x $U_{NDC}$<br>250 h / 500 h / 1000 h | $\lvert\Delta C/C\rvert \leq 5$ %<br>Increase of tan δ (10 kHz) ≤ 0.010<br>IR > 50 % of initial specified value |
| 9 | External visual | MIL-STD 883 method 2009 | Device construction, marking, and workmanship | Device construction and workmanship; legible marking |
| 10 | Physical dimension | JESD22 method JB-100 | Spec. | Datasheet |
| 11 | Terminal strength (leaded) | MIL-STD 202 method 211 | Test leaded device lead integrity only.<br>- A (pull-test): 44.1 N (10 s)<br>- C (wire-lead bend test): 227 g (3 x 3 s) | No visual damage |
| 12 | Resistance to solvents | MIL-STD 202 method 215 | Also aqueous chemical - OKEM clean or equivalent. Do not use banned solvents. | No visual damage<br>Legible marking |
| 13 | Mechanical shock | MIL-STD 202 method 213 | 100 *g*'s; 6 ms<br>half-sine; 3.75 m/s | No visual damage |



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| TEST CONDITIONS AND REQUIREMENTS ACCORDING AEC-Q200 REVISION E | | | | |
|---|---|---|---|---|
| **NO.** | **TEST NAME** | **REFERENCE** | **TEST CONDITIONS** | **PERFORMANCE REQUIREMENTS** |
| 14 | Vibration | MIL-STD 202 method 204 | 5 *g*'s for 20 min;<br>12 cycles x 3 directions<br>10 Hz to 2000 Hz | No visual damage |
| 15 | Resistance to soldering heat | MIL-STD 202 method 210 | 280 °C; 10 s<br>solder within 1.5 mm of device body | $\|\Delta C/C\| \leq 0.5$ %<br>Increase of tan δ (10 kHz) ≤ 0.010<br>IR > 50 % of initial specified value |
| 18 | Solderability | J-STD-002 | Leaded: method A at 235 °C,<br>category 3 (245 °C / 5 s) | Good tinning as evidence by free flowing of the solder with wetting of terminations > 95 % |
| 20 | Flammability | UL 94<br>IEC 60384-1 | One flame application<br>Class B | V-0 or V-1 are acceptable.<br>Class B or C acc. IEC is also acceptable |

**Note**

Measurement conditions at room temperature:

- Capacitance at 1 kHz
- tan δ 1 kHz, 10 kHz
- ESR 10 kHz
- Insulation resistance 500 V, 1 min after full charge

| TEST CONDITIONS FOR ADDITIONAL TEST AND REQUIREMENTS | | |
|---|---|---|
| **TEST NAME** | **TESTS CONDITIONS** | **PERFORMANCE REQUIREMENTS** |
| 1. Operational life | $T_A$ = 125 °C; 1.0 x $U_{OPDC}$ at 125 °C<br>100 h / 200 h / 300 h / 400 h / 500 h | $\|\Delta C/C\| \leq 5$ %<br>Increase of tan δ (10 kHz) ≤ 2 x tan δ<br>IR > 50 % of initial specified value |
| 2. Temperature cycling | 1000 cycles: -40 °C / +125 °C<br>30 min. dwell time at each temperature extreme<br>Transition time < 1 min | $\|\Delta C/C\| \leq 5$ %<br>Increase of tan δ (10 kHz) ≤ 2 x tan δ<br>IR > 50 % of initial specified value |

**Note**

Measurement conditions at room temperature:

- Capacitance at 1 kHz
- tan δ 1 kHz, 10 kHz
- ESR 10 kHz
- Insulation resistance 500 V, 1 min after full charge



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