

Metallized Polypropylene Film Interference Suppression Capacitors

■ Features

- Metallized polypropylene structure
- Withstanding overvoltage stressing
- Excellent active and passive flame resistant abilities
- Widely used in across-the-line, interference suppression circuit, etc.

■ Specifications

| | | | |
|--|---|--------------------------------------|---------------------------------------|
| Climatic Category/Passive Flammability Class | 40/110/56/B | | |
| Operating Temperature Range | -40°C ~ +110°C | | |
| Class | X2 | | |
| Rated Voltage | 250/275/305/310VAC,50/60Hz | | |
| Capacitance Range | 0.0010μF~10.0μF | | |
| Capacitance Tolerance | ± 10%(K)、 ± 20%(M) | | |
| Voltage Proof | Between Terminals: | 2 000Vdc(2s) C _R ≤ 1.0μF | |
| | | 1 800Vdc(2s) C _R > 1.0μF | |
| | Between Terminals To Case: | 2 120Vac(1min) | |
| Insulation Resistance | $\geq 15\ 000\ \Omega$, C _R ≤ 0.33μF $\geq 5\ 000s$, C _R > 0.33μF (20°C, 100V, 1min) | | |
| Dissipation Factor | 0.0010μF ≤ C _R ≤ 0.47μF | ≤ 10 x 10 ⁻⁴ (1kHz, 20°C) | ≤ 20 x 10 ⁻⁴ (10kHz, 20°C) |
| | 0.47μF < C _R ≤ 1.0μF | ≤ 20 x 10 ⁻⁴ (1kHz, 20°C) | ≤ 40 x 10 ⁻⁴ (10kHz, 20°C) |
| | C _R > 1.0μF | ≤ 30 x 10 ⁻⁴ (1kHz, 20°C) | ----- |

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Part Number Codes

| | | | | | | | | | | | | | | | |
|----------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| RND 150H | M | K | P | 3 | A | 1 | P | 1 | 0 | K | 0 | I | 2 | 0 | 0 |

1. 1-3 Type of Capacitor:

| | | | |
|------|-----|-----|-----|
| TYPE | MKP | MEF | MPP |
| CODE | MKP | MEF | MPP |

2. 4-6 Rated Voltage:

| | | |
|---------------------|-----------------------|------------------------|
| 063: 63VDC/JIS 1J. | 400: 400VDC/JIS 2G. | 1K6: 1,600VDC/JIS 3C. |
| 100: 100VDC/JIS 2A. | 630: 630VDC/JIS 2J. | 1N0: 10,000VDC/JIS 4A. |
| 250: 250VDC/JIS2E. | 1K0: 1,000VDC/JIS 3A. | 2A7: 275VAC |
| | | 3A1:310VAC. |



















3. 7-9 Symbols of Capacitance in uF:

- A: Indicates tens. EX: 12uF=A12, 10uF=A10.
- W(Word): Indicates unit. EX: 1.5uF=W15
- P(Point): Digits following the decimal point. EX: 0.22uF=P22
- S(Single Zero): Digits following the decimal point followed by one zero. EX: 0.015uF=S15
- D(Double Zeroes): Digits following the decimal point followed by two zeroes. EX: 0.0047uF=D47
- T(Triple Zeroes): Digits following the decimal point followed by three zeroes. EX: 0.00068uF=T68


4. 10 Symbols of Capacitance Tolerance:

| | | | | | | | | |
|-----------|-----|-----|-----|-----|------|------|----------|----------|
| TOLERANCE | ±1% | ±2% | ±3% | ±5% | ±10% | ±20% | +80%-20% | +100%-0% |
| CODE | F | G | H | J | K | M | Z | P |

5. 11 Lead Style Code:

| | | | | | | | | | | |
|-----------|---|---|---|---|---|---|---|---|---|--|
| CODE | 0 | | 1 | | 2 | | 3 | | 4 | |
| LEAD TYPE |  |  |  |  |  |  |  |  |  | |
| CODE | 5 | | 6 | | 7 | | A | | B | |
| LEAD TYPE |  |  |  |  |  |  |  |  |  | |

6. 12 Lead Space (mm)

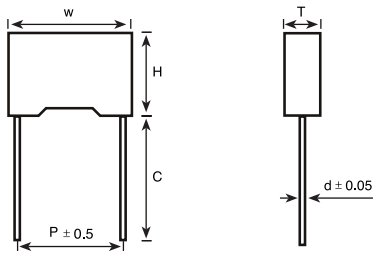
| | | | | | | | | | | | | | | | | | |
|-------|------|------|-----|-----|-----|------|------|------|------|------|------|------|------|------|------|------|---|
| SPACE | 3.5 | 4.0 | 5.0 | 6.0 | 7.5 | 10.0 | 12.5 | 15.0 | 20.0 | 22.5 | 27.5 | 30.0 | 31.5 | 32.0 | 37.5 | 42.5 |  |
| CODE | A | B | C | E | D | F | V | I | M | N | R | U | S | T | Q | W | O |
| SPACE | 47.5 | 52.5 | | | | | | | | | | | | | | | |
| CODE | P | Y | | | | | | | | | | | | | | | |

7. 13-14 Lead Length 3A=3.5 4A=4.5 05=5mm 5A=5.5 20=20mm

8. 15 Feature Codes 0:RoHS A:Halogen Free B:Capacitive Divider

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Dimensions(mm)

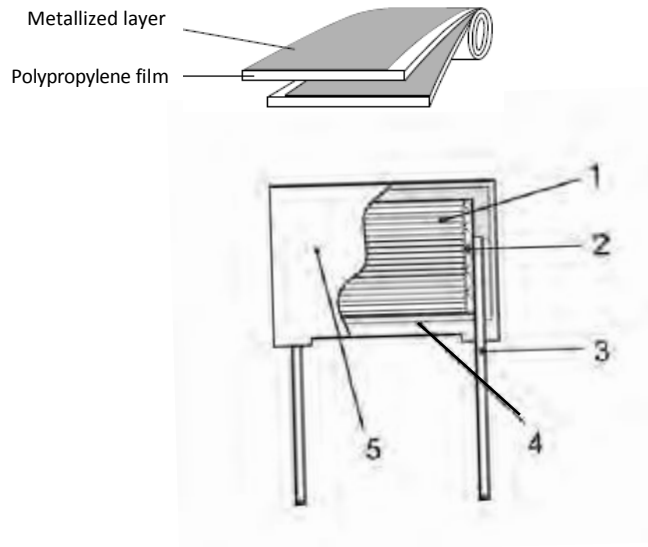


$W \pm 0.5, H \pm 0.5, T \pm 0.5$

| Rated Cap.uF | 310VAC | | | | | Rated Cap.uF | 310VAC | | | | | Rated Cap.uF | 310VAC | | | | |
|-----------------|--------|------|-----|-----------|------------|-----------------|--------|------|-----|-----------|------------|-----------------|--------|------|------|-----------|------------|
| | W | H | T | P | d | | W | H | T | P | d | | W | H | T | P | d |
| | max | max | max | ± 1.0 | ± 0.05 | | max | max | max | ± 1.0 | ± 0.05 | | max | max | max | ± 1.0 | ± 0.05 |
| 0.001 | 10 | 9 | 4 | 7.5 | 0.6 | 0.01 | 18 | 11 | 5 | 15 | 0.6/0.8 | 0.47 | 31 | 18 | 9 | 27.5 | 0.8 |
| 0.018 | 10.5 | 9 | 4 | 7.5 | 0.6 | 0.012 | 18 | 11 | 5 | 15 | 0.6/0.8 | 0.68 | 31 | 19 | 11 | 27.5 | 0.8 |
| 0.0022 | 10 | 9 | 4 | 7.5 | 0.6 | 0.015 | 18 | 11 | 5 | 15 | 0.6/0.8 | 0.82 | 31 | 19 | 11 | 27.5 | 0.8 |
| 0.0022 | 10 | 9 | 4 | 7.5 | 0.6 | 0.022 | 18 | 11 | 5 | 15 | 0.6/0.8 | 1 | 31 | 19 | 11 | 27.5 | 0.8 |
| 0.0033 | 10 | 9 | 4 | 7.5 | 0.6 | 0.033 | 18 | 11 | 5 | 15 | 0.6/0.8 | 1.2 | 31 | 22 | 13 | 27.5 | 0.8 |
| 0.0033 | 10 | 9 | 4 | 7.5 | 0.6 | 0.033 | 18 | 11 | 5 | 15 | 0.6/0.8 | 1.5 | 31 | 22 | 13 | 27.5 | 0.8 |
| 0.0047 | 10 | 9 | 4 | 7.5 | 0.6 | 0.047 | 18 | 11 | 5 | 15 | 0.6/0.8 | 1.8 | 31 | 24.5 | 14 | 27.5 | 0.8 |
| 0.0047 | 10 | 9 | 4 | 7.5 | 0.6 | 0.068 | 18 | 11 | 5 | 15 | 0.6/0.8 | 2 | 31 | 28 | 14 | 27.5 | 0.8 |
| 0.0068 | 10 | 9 | 4 | 7.5 | 0.6 | 0.082 | 18 | 11 | 5 | 15 | 0.6/0.8 | 2.2 | 31 | 28 | 14 | 27.5 | 0.8 |
| 0.0082 | 10 | 9 | 4 | 7.5 | 0.6 | 0.1 | 18 | 11 | 5 | 15 | 0.6/0.8 | 2.5 | 31 | 28 | 17 | 27.5 | 0.8 |
| 0.01 | 10 | 9 | 4 | 7.5 | 0.6 | 0.1 | 18 | 12 | 6 | 15 | 0.8 | 2.7 | 31 | 33 | 18 | 27.5 | 0.8 |
| 0.022 | 10 | 9 | 4 | 7.5 | 0.6 | 0.15 | 18 | 12 | 6 | 15 | 0.8 | 3 | 31 | 33 | 18 | 27.5 | 0.8 |
| 0.033 | 10 | 11 | 5 | 7.5 | 0.6 | 0.18 | 18 | 13 | 7 | 15 | 0.8 | 3.3 | 31 | 33 | 18 | 27.5 | 0.8 |
| 0.047 | 10 | 12 | 6 | 7.5 | 0.6 | 0.22 | 18 | 14.5 | 8.5 | 15 | 0.8 | 4.7 | 31 | 37 | 22 | 27.5 | 0.8 |
| 0.068 | 10 | 13.5 | 8.5 | 7.5 | 0.6 | 0.27 | 18 | 14.5 | 8.5 | 15 | 0.8 | 1.5 | 41 | 26 | 14.5 | 37.5 | 1.0 |
| 0.1 | 10 | 13.5 | 8.5 | 7.5 | 0.6 | 0.33 | 18 | 14.5 | 8.5 | 15 | 0.8 | 1.8 | 41 | 26 | 14.5 | 37.5 | 1.0 |
| 0.0022 | 13 | 9 | 4 | 10 | 0.6 | 0.39 | 18 | 16 | 10 | 15 | 0.8 | 2 | 41 | 26 | 14.5 | 37.5 | 1.0 |
| 0.0022 | 13 | 9 | 4 | 10 | 0.6 | 0.47 | 18 | 16 | 10 | 15 | 0.8 | 2.2 | 41.5 | 26 | 14.5 | 37.5 | 1.0 |
| 0.0047 | 13 | 9 | 4 | 10 | 0.6 | 0.47 | 18 | 18 | 9 | 15 | 0.8 | 2.5 | 41.5 | 26 | 14.5 | 37.5 | 1.0 |
| 0.0047 | 13 | 9 | 4 | 10 | 0.6 | 0.56 | 18 | 18 | 10 | 15 | 0.8 | 2.7 | 41.5 | 26 | 14.5 | 37.5 | 1.0 |
| 0.0068 | 13 | 9 | 4 | 10 | 0.6 | 0.68 | 18 | 19 | 11 | 15 | 0.8 | 3 | 41.5 | 30 | 17 | 37.5 | 1.0 |
| 0.0068 | 13 | 9 | 4 | 10 | 0.6 | 0.68 | 18 | 21 | 12 | 15 | 0.8 | 3.3 | 41.5 | 30 | 17 | 37.5 | 1.0 |
| 0.0082 | 13 | 9 | 4 | 10 | 0.6 | 0.15 | 26.5 | 15 | 6 | 22.5 | 0.8 | 3.9 | 41.5 | 30 | 17 | 37.5 | 1.0 |
| 0.0082 | 13 | 9 | 4 | 10 | 0.6 | 0.18 | 26.5 | 15 | 6 | 22.5 | 0.8 | 4.7 | 41.5 | 35 | 19 | 37.5 | 1.0 |
| 0.01 | 13 | 9 | 4 | 10 | 0.6 | 0.22 | 26.5 | 15 | 6 | 22.5 | 0.8 | 5.6 | 41.5 | 35.5 | 22.5 | 37.5 | 1.0 |
| 0.022 | 13 | 9 | 4 | 10 | 0.6 | 0.27 | 26.5 | 15 | 6 | 22.5 | 0.8 | 6.8 | 41.5 | 35.5 | 22.5 | 37.5 | 1.0 |
| 0.027 | 13 | 11 | 5 | 10 | 0.6 | 0.33 | 26.5 | 16.5 | 7 | 22.5 | 0.8 | 8.2 | 41.5 | 41 | 27.5 | 37.5 | 1.0 |
| 0.033 | 13 | 9 | 4 | 10 | 0.6 | 0.39 | 26.5 | 16.5 | 7 | 22.5 | 0.8 | 10 | 41.5 | 41 | 27.5 | 37.5 | 1.0 |
| 0.047 | 13 | 11 | 5 | 10 | 0.6 | 0.47 | 26.5 | 17 | 8.5 | 22.5 | 0.8 | | | | | | |
| 0.056 | 13 | 11 | 5 | 10 | 0.6 | 0.56 | 26.5 | 19 | 10 | 22.5 | 0.8 | | | | | | |
| 0.068 | 13 | 12 | 6 | 10 | 0.6 | 0.68 | 26.5 | 19 | 10 | 22.5 | 0.8 | | | | | | |
| 0.082 | 13 | 12 | 6 | 10 | 0.6 | 0.82 | 26.5 | 19 | 10 | 22.5 | 0.8 | | | | | | |
| 0.1 | 13 | 12 | 6 | 10 | 0.6 | 1 | 26.5 | 20 | 11 | 22.5 | 0.8 | | | | | | |
| 0.15 | 13 | 14 | 8 | 10 | 0.6 | 1.2 | 26.5 | 22 | 12 | 22.5 | 0.8 | | | | | | |
| 0.18 | 13 | 16 | 8 | 10 | 0.6 | 1.5 | 26.5 | 23 | 13 | 22.5 | 0.8 | | | | | | |
| 0.22 | 13 | 16 | 8 | 10 | 0.6 | 1.8 | 26.5 | 24 | 14 | 22.5 | 0.8 | | | | | | |
| | | | | | | 2 | 26.5 | 25 | 15 | 22.5 | 0.8 | | | | | | |
| | | | | | | 2.2 | 26.5 | 25 | 15 | 22.5 | 0.8 | | | | | | |

Metallized Polypropylene Film Interference Suppression Capacitors

Construction of Component



| Item | Component | Material | RoHS Requirements |
|------|-------------------|-------------------------------------|---------------------|
| 1 | Element | Metallized OPP film | Compliant with RoHS |
| 2 | Metal spray layer | Zn and Zn-Tin alloy wire | Compliant with RoHS |
| 3 | Leads | Tinned copper-base alloy wire | Compliant with RoHS |
| 4 | Potting compound | Flame retardant epoxy resin(UL94V0) | Compliant with RoHS |
| 5 | Enclosure | Flame retardant PBT plastic(UL940V) | Compliant with RoHS |
| 5.1 | Marking | Inks | Compliant with RoHS |
| | | Laser | |

Metallized Polypropylene Film Interference Suppression Capacitors

2. Technical Specification

| No. | Test item | Performance | Test method (refer to IEC60384-14) |
|-----|-----------------------|---|--|
| 1 | Withstand voltage | No permanent breakdown or flashover | Ref 4.2.1 clause |
| | (T-T) | | 1183VDC / 60sec |
| | Terminal case | | 2050VAC, 50/60HZ , 60sec |
| 2 | Insulation resistance | $C_R \leq 0.33\mu f$; $IR > 15000M\Omega$ | Ref 4.2.5 clause Charge voltage 100VDC Charge time 60sec |
| | | $C_R > 0.33\mu f$; $IR > 5000S$ | |
| 3 | Capacitance | $J \pm 5\%$; $K \pm 10\%$; $M \pm 20\%$ | Ref 4.2.2 clause 1V, 1KHZ (25°C±5°C) |
| 4 | Dissipation factor | $0.01\mu f \leq C_R \leq 0.1\mu f, \cong 0.15\%$ (P=10) $0.01\mu f \leq C_R \leq 0.47\mu f, \cong 0.1\%$ $0.47\mu f < C_R \leq 1.0\mu f, \cong 0.2\%$ $C_R > 1.0\mu f, \leq 0.3\%$ | Ref 4.2.3 clause 1V, 1KHZ (25°C±5°C) |
| 5 | Solderability | At least 90% immersed lead wire should be covered new solder. | Ref 4.5 clause Test Ta 235±5°C; 2±0.5 Solder temperature: 235±5°C Immersion time: 2±0.5 sec |
| 6 | Terminal strength | There shall be no visible damage | Ref 4.3 clause $0.5 < d \leq 0.8, 10N$ $0.8 < d \leq 1.25, 20N$ Ub: $0.5 < d \leq 0.8, 5N$ $0.8 < d \leq 1.25, 10N$ Tense: $0.5 < d \leq 0.8, 5N$ $0.8 < d \leq 1.25, 10N$ Bend: $0.5 < d \leq 0.8, 5N$ $0.8 < d \leq 1.25, 10N$ Bent 2 times each direction |

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2. Technical Specification

| No. | Test item | Performance | Test method (refer to IEC60384-14) |
|-----|-----------------------------------|---|--|
| 7 | Resistance to solder heat | There should be no visible damage, $\Delta C/C < \pm 5\%$ | Ref 4.4 clause Tb , method 1A Solder temperature $260 \pm 5^\circ\text{C}$ Immersion time: $10 \pm 1\text{sec}$ |
| 8 | Solvent resistance of the marking | The marking should be legible. | Ref 4.20 clause Solvent :Industrial isopropanal Use absorbent cotton wool |
| 9 | Initial measurement | Capacitance, $\text{Tan } \delta$ | |
| | Rapid change of temperature | There should be no visible damage. | Ref 4.6 clause $\theta_A = -40^\circ\text{C}$, $\theta_B = +110^\circ\text{C}$ Duration=30min |
| | Vibration | There should be no visible damage. | Ref 4.7 clause Amplitude 0.75mm or acceleration 0.98m/s^2 ,(whichever is the smaller values) 10~500HZ 2h each direction, total 6h |
| | Bump | There should be no visible damage, $\Delta C/C < \pm 5\%$ | Ref 4.8 clause 4000 times ,acceleration 390m/s^2 Pulse duration 6ms |

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2. Technical Specification

| No. | Test item | Performance | Test method (refer to IEC60384-14) |
|-----|------------------------|---|---|
| 9 | Final measurement | There should be no visible damage, $\Delta C/C \leq \pm 5\%$ | |
| 10 | Initial measurement | | Ref 4.11clause |
| | Dry heat | | +110°C, 16h |
| | Cold | | -40°C, 2h |
| | Damp heat, cyclic | | Test Db, remaining cycles |
| | Final measurement | <p>There should be no visible damage, legible marking.</p> <p>Capacitance change $\Delta C/C \leq \pm 5\%$</p> <p>Increase of $\tan \delta$</p> <p>$C_R \leq 1\mu\text{f}$: ≤ 0.008 (10khz)</p> <p>$C_R > 1\mu\text{f}$: ≤ 0.005 (1khz)</p> <p>Dielectric strength: there shall be no permanent breakdown or flashover.</p> <p>IR > 50% *Rate value</p> | |
| 11 | Damp heat steady state | <p>There should be no visible damage, legible marking.</p> <p>Capacitance change $\Delta C/C \leq \pm 5\%$</p> <p>Increase of $\tan \delta$:</p> | <p>Ref 4.12clause</p> <p>Temperature: $40 \pm 2\%$</p> <p>$93 \pm 2\%$ RH Humidity: $93 \pm 2\%$ RH</p> <p>Duration: 21 days</p> |

Metallized Polypropylene Film Interference Suppression Capacitors

2. Technical Specification

| No. | Test item | Performance | Test method (refer to IEC60384-14) |
|-----|------------------------|---|--|
| 11 | Damp heat steady state | $C_R \leq 1\mu\text{f}$: ≤ 0.008 (10kHz) $C_R > 1\mu\text{f}$: ≤ 0.005 (1kHz) Dielectric strength: there shall be no permanent breakdown or flashover. $IR > 50\%$ *Rate value | |
| 12 | Impulse voltage | There are three or more waveforms which indicate that no self-healing breakdown or flashover have occurred when it's monitored by the monitor | Ref 4.13 clause $C_R \leq 1\mu\text{f}$: $U_p = 2.5\text{KV}$ $C_R > 1\mu\text{f}$: $U_p = 2.5 / \sqrt{C_R} \text{ (KV)}$ Each individual capacitor shall be subjected to 24 times impulse of the same polarity (when any three successive impulses are shown by monitor to have a waveform indicating that no self-healing breakdown have taken place, the impulses can be stopped), the times between the impulses shall not be less than 10sec, and the peak of the impulse voltage is : $C_R \leq 1\mu\text{f}$: $U_p = 2.5\text{KV}$ $C_R > 1\mu\text{f}$: $U_p = 2.5 / \sqrt{C_R} \text{ (KV)}$ |

Metallized Polypropylene Film Interference Suppression Capacitors

2. Technical Specification

| No. | Test item | Performance | Test method (refer to IEC60384-14) |
|-----|----------------------|---|--|
| 13 | Endurance | <p>There should be no visible damage, legible marking.</p> <p>Capacitance change $\Delta C/C \leq 10\%$</p> <p>Increase of $\tan\delta$:</p> <p>$C_R \leq 1\mu\text{f}$: ≤ 0.008 (10khz)</p> <p>$C_R > 1\mu\text{f}$: ≤ 0.005 (1khz)</p> <p>Dielectric strength: there shall be no permanent breakdown or flashover</p> <p>IR > 50% *Rate value</p> | <p>Ref 4.14 clause</p> <p>Applied voltage 334vac ($1.25 \cdot U_R$) at 105°C, 1000h. (The voltage should be subjected to 1000rms for 0.1s every one hour during test.)</p> |
| 14 | Charge and Discharge | <p>Capacitance change $\Delta C/C \leq 10\%$</p> <p>Increase of $\tan\delta$:</p> <p>$C_R \leq 1\mu\text{f}$: ≤ 0.008 (10khz)</p> <p>$C_R > 1\mu\text{f}$: ≤ 0.005 (1khz)</p> <p>Dielectric strength: there shall be no permanent breakdown or flashover</p> <p>IR > 50% *Rate value</p> | <p>Ref 4.15 clause</p> $R = \frac{550}{C_R \times dU/dt} = \frac{5.50}{C_R} (\Omega)$ <p>dv/dt: 最大100v/us</p> <p>Times: 10,000</p> <p>Duration of charge: 0.5sec</p> <p>Duration of discharge: 0.5sec</p> <p>Charging voltage: 550vdc</p> <p>Charge resistor: $220/C_R(\Omega)$ or</p> <p>The limited current should be</p> |

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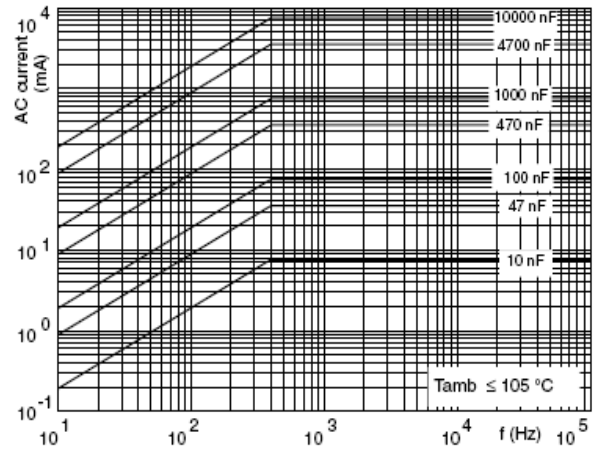
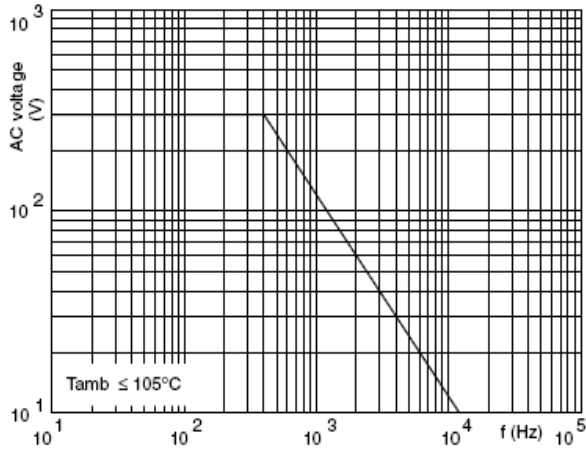
2. Technical Specification

| No. | Test item | Performance | Test method (refer to IEC60384-14) |
|-----|----------------------|---|---|
| 14 | Charge and Discharge | | no more than 1A,(whichever the resistance value is the greater) DV/DT(V/us): 100v/us max |
| 15 | Passive flammability | The flaming time of each sampling capacitor shall not go beyond 30sec after it is taken apart from the flame. Drop of each capacitor caused by the flame shall not fire the tissue below. | Ref 4.17 clause Needle flame test The category of flammability :C Expose time:1time Capacitor volume Exposing time $250 < V(\text{mm}^3) \leq 500 \quad s=20$ $500 < V(\text{mm}^3) \leq 1750 \quad s=30$ $V(\text{mm}^3) > 1750 \quad s=60$ |
| 16 | Active flammability | The cheesecloth around the capacitor shall not burn with a flame. | The specimens shall be individually wrapped at least 1 layer, but not more than 2 layers, complete of cheesecloth,thecheesecloth should be untreated pure cotton.Each sample shall be subjected to 20 discharged ,the interval between successtive discharges shall be 5s $U_i = 2.5\text{KV} \pm 7\%$ |

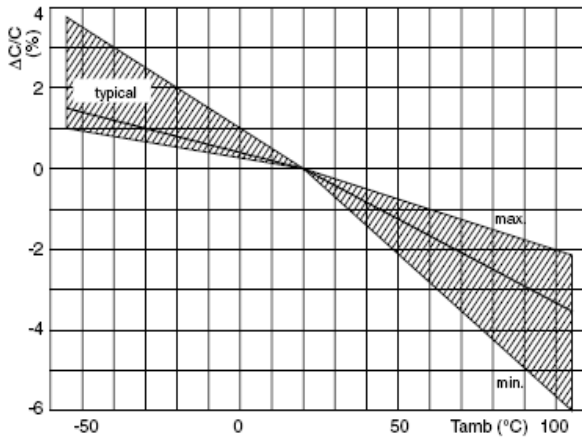
Metallized Polypropylene Film Interference Suppression Capacitors

Characteristic Curve

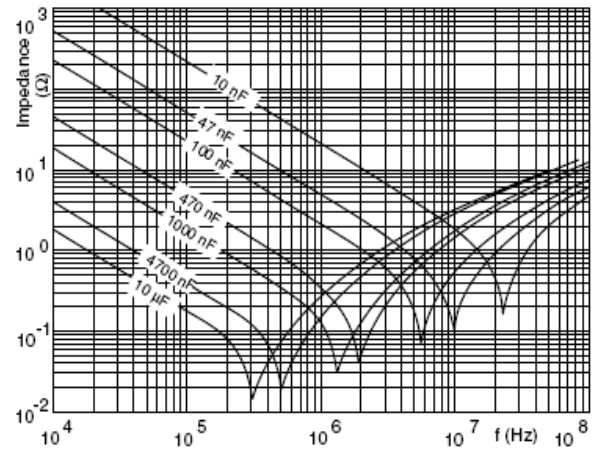
MAXIMUM RMS VOLTAGE AND AC CURRENT (SINEWAVE) AS A FUNCTION OF FREQUENCY



CAPACITANCE



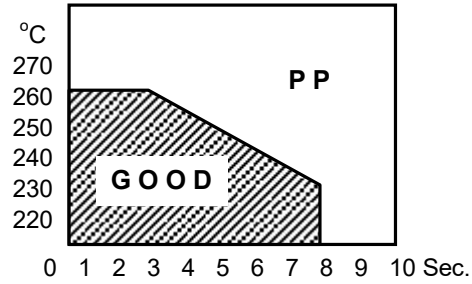
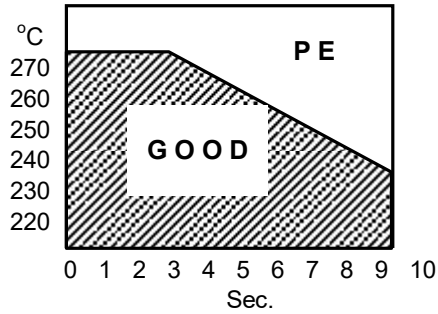
IMPEDANCE



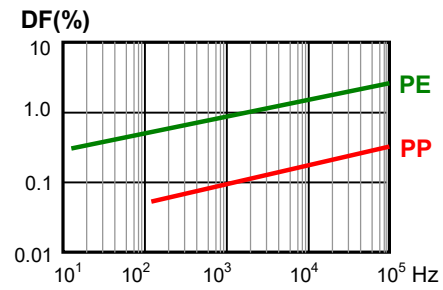
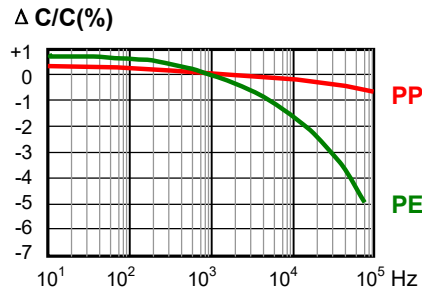
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Characteristics Reference

Soldering Temperature VS Time



Frequency Characteristics



Temperature Characteristics

