

Types MC and MCN Multilayer RF Capacitors

High-Frequency, High-Power, High-Voltage Chips with Nonmagnetic Option



Rugged flexibility and compatibility with FR4 boards make Type MC and MCN capacitors ideal for use where other multilayer caps aren't recommended because of cracking. The natural mica dielectric retains its high-Q to many megahertz, so higher frequency applications are limited by the circuit inductance, not the Type MC capacitor. **Nonmagnetic** Type MCN chips are available for MRI and other high frequency applications that often use more expensive porcelain ceramic chips.

Highlights

- Extremely high Q at UHF/VHF frequencies
- Free from thermal cracking, FR4 compatible
- Wave solderable
- Nonmagnetic option
- Exceed 2 mm bend test
- Better than porcelain
- High RF current — dV/dt 20,000 V/ μ s
- Rock stable: No change with time, V & f

Applications

- MRI Coils and Generators
- RF Instruments
- Power Amplifiers
- Tuned LCR Circuits
- CATV
- Ground and Flight Mobile Radio
- Lasers
- Software - Defined Frequency-Hopping Radio

Specifications

| | |
|-------------------------------|--------------------------------|
| Voltages: | 100 Vdc, 500 Vdc, and 1000 Vdc |
| Capacitance Range: | 0.5 pF to 2,200 pF |
| Capacitance Tolerance: | ± 0.1 pF to $\pm 5\%$ |
| Temperature Range: | -55 °C to +125 °C |
| Case Sizes: | 0805, 1210, 1812, and 2220 |

Ratings

RoHS Compliant

| Cap (pF) | Catalog Part Number | Case Type |
|----------|---------------------|-----------|
| 100 Vdc | | |
| 0.5 | MC08CA0R5D-F | 0805 |
| 1.0 | MC08CA010D-F | 0805 |
| 2.0 | MC08CA020D-F | 0805 |
| 3.0 | MC08CA030D-F | 0805 |
| 4.0 | MC08CA040D-F | 0805 |
| 5.0 | MC08CA050D-F | 0805 |
| 6.0 | MC08CA060D-F | 0805 |
| 7.0 | MC08CA070D-F | 0805 |
| 8.0 | MC08CA080D-F | 0805 |
| 9.0 | MC08CA090D-F | 0805 |
| 10.0 | MC08CA100D-F | 0805 |
| 12.0 | MC08EA120J-F | 0805 |
| 15.0 | MC08EA150J-F | 0805 |
| 18.0 | MC08EA180J-F | 0805 |
| 20.0 | MC08EA200J-F | 0805 |
| 22.0 | MC08EA220J-F | 0805 |
| 24.0 | MC08EA240J-F | 0805 |
| 27.0 | MC08EA270J-F | 0805 |
| 30.0 | MC08EA300J-F | 0805 |
| 33.0 | MC08FA330J-F | 0805 |
| 36.0 | MC08FA360J-F | 0805 |
| 39.0 | MC08FA390J-F | 0805 |
| 43.0 | MC08FA430J-F | 0805 |
| 47.0 | MC08FA470J-F | 0805 |
| 50.0 | MC08FA500J-F | 0805 |
| 51.0 | MC08FA510J-F | 0805 |
| 56.0 | MC08FA560J-F | 0805 |
| 62.0 | MC08FA620J-F | 0805 |

| Cap (pF) | Catalog Part Number | Case Type |
|----------|---------------------|-----------|
| 100 Vdc | | |
| 68 | MC08FA680J-F | 0805 |
| 75 | MC08FA750J-F | 0805 |
| 82 | MC08FA820J-F | 0805 |
| 91 | MC08FA910J-F | 0805 |
| 100 | MC08FA101J-F | 0805 |
| 47 | MC12FA470J-F | 1210 |
| 50 | MC12FA500J-F | 1210 |
| 51 | MC12FA510J-F | 1210 |
| 56 | MC12FA560J-F | 1210 |
| 62 | MC12FA620J-F | 1210 |
| 68 | MC12FA680J-F | 1210 |
| 75 | MC12FA750J-F | 1210 |
| 82 | MC12FA820J-F | 1210 |
| 91 | MC12FA910J-F | 1210 |
| 100 | MC12FA101J-F | 1210 |
| 110 | MC12FA111J-F | 1210 |
| 120 | MC12FA121J-F | 1210 |
| 130 | MC12FA131J-F | 1210 |
| 150 | MC12FA151J-F | 1210 |
| 160 | MC12FA161J-F | 1210 |
| 180 | MC12FA181J-F | 1210 |
| 200 | MC12FA201J-F | 1210 |
| 220 | MC12FA221J-F | 1210 |
| 240 | MC12FA241J-F | 1210 |
| 250 | MC12FA251J-F | 1210 |
| 270 | MC12FA271J-F | 1210 |
| 300 | MC12FA301J-F | 1210 |
| 330 | MC12FA331J-F | 1210 |

| Cap (pF) | Catalog Part Number | Case Type |
|----------|---------------------|-----------|
| 100 Vdc | | |
| 360 | MC12FA361J-F | 1210 |
| 390 | MC12FA391J-F | 1210 |
| 430 | MC12FA431J-F | 1210 |
| 250 | MC18FA251J-F | 1812 |
| 270 | MC18FA271J-F | 1812 |
| 300 | MC18FA301J-F | 1812 |
| 330 | MC18FA331J-F | 1812 |
| 360 | MC18FA361J-F | 1812 |
| 390 | MC18FA391J-F | 1812 |
| 430 | MC18FA431J-F | 1812 |
| 470 | MC18FA471J-F | 1812 |
| 500 | MC18FA501J-F | 1812 |
| 510 | MC18FA511J-F | 1812 |
| 560 | MC18FA561J-F | 1812 |
| 620 | MC18FA621J-F | 1812 |
| 680 | MC18FA681J-F | 1812 |
| 750 | MC18FA751J-F | 1812 |
| 820 | MC18FA821J-F | 1812 |
| 910 | MC22FA911J-F | 2220 |
| 1000 | MC22FA102J-F | 2220 |
| 1100 | MC22FA112J-F | 2220 |
| 1200 | MC22FA122J-F | 2220 |
| 1500 | MC22FA152J-F | 2220 |
| 1800 | MC22FA182J-F | 2220 |
| 2000 | MC22FA202J-F | 2220 |
| 2200 | MC22FA222J-F | 2220 |

| Cap (pF) | Catalog Part Number | Case Type | Cap (pF) | Catalog Part Number | Case Type | Cap (pF) | Catalog Part Number | Case Type |
|----------------|---------------------|-----------|----------------|---------------------|-----------|----------------|---------------------|-----------|
| 500 Vdc | | | 500 Vdc | | | 500 Vdc | | |
| 0.5 | MC08CD0R5D-F | 0805 | 18 | MC12ED180J-F | 1210 | 130 | MC18FD131J-F | 1812 |
| 1 | MC08CD010D-F | 0805 | 20 | MC12ED200J-F | 1210 | 150 | MC18FD151J-F | 1812 |
| 2 | MC08CD020D-F | 0805 | 22 | MC12ED220J-F | 1210 | 160 | MC18FD161J-F | 1812 |
| 3 | MC08CD030D-F | 0805 | 24 | MC12ED240J-F | 1210 | 180 | MC18FD181J-F | 1812 |
| 4 | MC08CD040D-F | 0805 | 27 | MC12ED270J-F | 1210 | 200 | MC18FD201J-F | 1812 |
| 5 | MC08CD050D-F | 0805 | 30 | MC12ED300J-F | 1210 | 220 | MC18FD221J-F | 1812 |
| 6 | MC08CD060D-F | 0805 | 33 | MC12FD330J-F | 1210 | 240 | MC18FD241J-F | 1812 |
| 7 | MC08CD070D-F | 0805 | 36 | MC12FD360J-F | 1210 | 250 | MC18FD251J-F | 1812 |
| 8 | MC08CD080D-F | 0805 | 39 | MC12FD390J-F | 1210 | 270 | MC18FD271J-F | 1812 |
| 9 | MC08CD090D-F | 0805 | 43 | MC12FD430J-F | 1210 | 300 | MC18FD301J-F | 1812 |
| 10 | MC08CD100D-F | 0805 | 47 | MC12FD470J-F | 1210 | 330 | MC18FD331J-F | 1812 |
| 12 | MC08ED120J-F | 0805 | 50 | MC12FD500J-F | 1210 | 360 | MC18FD361J-F | 1812 |
| 15 | MC08ED150J-F | 0805 | 51 | MC12FD510J-F | 1210 | 390 | MC18FD391J-F | 1812 |
| 18 | MC08ED180J-F | 0805 | 56 | MC12FD560J-F | 1210 | 430 | MC18FD431J-F | 1812 |
| 20 | MC08ED200J-F | 0805 | 62 | MC12FD620J-F | 1210 | 470 | MC18FD471J-F | 1812 |
| 1 | MC12CD010D-F | 1210 | 68 | MC12FD680J-F | 1210 | 500 | MC22FD501J-F | 2220 |
| 2 | MC12CD020D-F | 1210 | 75 | MC12FD750J-F | 1210 | 510 | MC22FD511J-F | 2220 |
| 3 | MC12CD030D-F | 1210 | 82 | MC12FD820J-F | 1210 | 560 | MC22FD561J-F | 2220 |
| 4 | MC12CD040D-F | 1210 | 91 | MC12FD910J-F | 1210 | 620 | MC22FD621J-F | 2220 |
| 5 | MC12CD050D-F | 1210 | 100 | MC12FD101J-F | 1210 | 680 | MC22FD681J-F | 2220 |
| 6 | MC12CD060D-F | 1210 | 110 | MC12FD111J-F | 1210 | 750 | MC22FD751J-F | 2220 |
| 7 | MC12CD070D-F | 1210 | 120 | MC12FD121J-F | 1210 | 820 | MC22FD821J-F | 2220 |
| 8 | MC12CD080D-F | 1210 | 130 | MC12FD131J-F | 1210 | 910 | MC22FD911J-F | 2220 |
| 9 | MC12CD090D-F | 1210 | 150 | MC12FD151J-F | 1210 | 1000 | MC22FD102J-F | 2220 |
| 10 | MC12CD100D-F | 1210 | 100 | MC18FD101J-F | 1812 | 1100 | MC22FD112J-F | 2220 |
| 12 | MC12ED120J-F | 1210 | 110 | MC18FD111J-F | 1812 | 1200 | MC22FD122J-F | 2220 |
| 15 | MC12ED150J-F | 1210 | 120 | MC18FD121J-F | 1812 | | | |

| Cap (pF) | Catalog Part Number | Case Type | Cap (pF) | Catalog Part Number | Case Type | Cap (pF) | Catalog Part Number | Case Type |
|-----------------|---------------------|-----------|-----------------|---------------------|-----------|-----------------|---------------------|-----------|
| 1000 Vdc | | | 1000 Vdc | | | 1000 Vdc | | |
| 0.5 | MC12CF0R5D-F | 1210 | 39 | MC12FF390J-F | 1210 | 250 | MC22FF251J-F | 2220 |
| 1.0 | MC12CF010D-F | 1210 | 43 | MC12FF430J-F | 1210 | 270 | MC22FF271J-F | 2220 |
| 2.0 | MC12CF020D-F | 1210 | 47 | MC12FF470J-F | 1210 | 300 | MC22FF301J-F | 2220 |
| 3.0 | MC12CF030D-F | 1210 | 50 | MC12FF500J-F | 1210 | 330 | MC22FF331J-F | 2220 |
| 4.0 | MC12CF040D-F | 1210 | 51 | MC22FF510J-F | 2220 | 360 | MC22FF361J-F | 2220 |
| 5.0 | MC12CF050D-F | 1210 | 56 | MC22FF560J-F | 2220 | 390 | MC22FF391J-F | 2220 |
| 6.0 | MC12CF060D-F | 1210 | 62 | MC22FF620J-F | 2220 | 430 | MC22FF431J-F | 2220 |
| 7.0 | MC12CF070D-F | 1210 | 68 | MC22FF680J-F | 2220 | 470 | MC22FF471J-F | 2220 |
| 8.0 | MC12CF080D-F | 1210 | 75 | MC22FF750J-F | 2220 | 500 | MC22FF501J-F | 2220 |
| 9.0 | MC12CF090D-F | 1210 | 82 | MC22FF820J-F | 2220 | 510 | MC22FF511J-F | 2220 |
| 10.0 | MC12CF100D-F | 1210 | 91 | MC22FF910J-F | 2220 | 560 | MC22FF561J-F | 2220 |
| 12.0 | MC12EF120J-F | 1210 | 100 | MC22FF101J-F | 2220 | 620 | MC22FF621J-F | 2220 |
| 15.0 | MC12EF150J-F | 1210 | 110 | MC22FF111J-F | 2220 | 680 | MC22FF681J-F | 2220 |
| 18.0 | MC12EF180J-F | 1210 | 120 | MC22FF121J-F | 2220 | 750 | MC22FF751J-F | 2220 |
| 20.0 | MC12EF200J-F | 1210 | 130 | MC22FF131J-F | 2220 | 820 | MC22FF821J-F | 2220 |
| 22.0 | MC12EF220J-F | 1210 | 150 | MC22FF151J-F | 2220 | 910 | MC22FF911J-F | 2220 |
| 24.0 | MC12EF240J-F | 1210 | 160 | MC22FF161J-F | 2220 | 1000 | MC22FF102J-F | 2220 |
| 27.0 | MC12EF270J-F | 1210 | 180 | MC22FF181J-F | 2220 | 1100 | MC22FF112J-F | 2220 |
| 30.0 | MC12EF300J-F | 1210 | 200 | MC22FF201J-F | 2220 | 1200 | MC22FF122J-F | 2220 |
| 33.0 | MC12FF330J-F | 1210 | 220 | MC22FF221J-F | 2220 | 1500 | MC22FF152J-F | 2220 |
| 36.0 | MC12FF360J-F | 1210 | 240 | MC22FF241J-F | 2220 | | | |

Types MC and MCN Multilayer RF Capacitors

Part Numbering System and Ordering Information

Order by complete part number, as below. For other options, write your requirement on your RFQ.

| MC(N) CDE Type | 22 Case Code | F Temperature Coefficient | D Voltage | 122 Capacitance | J Capacitor Tolerance | - Package | F RoHS (MC only) |
|------------------------------------|--|---------------------------------|--|---|--------------------------|---|---------------------------------|
| MC = Standard MCN = Nonmagnetic | 08 = 0805 12 = 1210 18 = 1812 22 = 2220 | | A = 100 Vdc D = 500 Vdc F = 1000 Vdc | 010 = 1 pF 1R8 = 1.8 pF (187) = 187 pF 182 = 1800 pF | | Blank = Bulk T = Tape & reel not specific | MCN complies (no F required) |

| TC Code | Capacitance Range (pF) | Temperature Coefficient ppm/°C | Capacitance Drift |
|------------|---------------------------|-----------------------------------|----------------------|
| C | 0.5 to 10 | 100 ±100 | ±(0.5% +0.1 pF) |
| E | 10.5 to 30 | 50 ±50 | ±(0.1% +0.1 pF) |
| F | 30.5 & up | 25 ±25 | ±(0.05% +0.1 pF) |

| Tol. Code | Tolerance | Capacitance Range |
|--------------|-----------|----------------------|
| B | ±0.1 pF | 0.5 pF to 5 pF |
| C | ±0.25 pF | 0.5 pF to 100 pF |
| D | ±0.5 pF | 0.5 pF to 10 pF |
| D | ±0.50% | 50.5 pF to 100 pF |
| F | ±1 pF | 5.5 pF to 10 pF |
| F | ±1% | 25.5 pF and up |
| G | ±2% | 13.0 pF and up |
| J | ±5% | 10.5 pF and up |

Available Capacitance Values

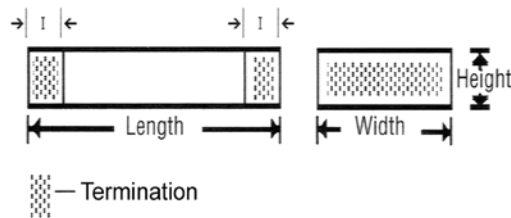
| Case Code | Capacitance (pF) | | | Minimum Cap. Step, pF |
|--------------|------------------|--------------|--------------|-----------------------------|
| | 100 Vdc | 500 Vdc | 1000 Vdc | |
| 08 | 0.5 to 100 | 0.5 to 20 | N/A | 0.5 |
| 12 | 43.5 to 100 | 0.5 to 100 | N/A | 0.5 |
| 12 | 101 to 430 | 101 to 150 | N/A | 1.0 |
| 12 | | | 0.5 to 50 | 1.0 |
| 18 | 241 to 820 | 91.5 to 470 | N/A | 1.0 |
| 22 | 821 to 1000 | 471 to 1000 | N/A | 1.0 |
| 22 | 1010 to 2200 | 1010 to 1200 | 50.5 to 1500 | 10.0 |

Standard Minimum Quanti-

| Reel Packed |
|----------------------------------|
| Case Codes 08 & 12: 3,000/reel* |
| Case Codes 18 & 22: 1,000/reel** |
| Bulk Packed |
| 100 per bag |

*note - MC12, 100 volt units -250 pF and above, and 500 volt units -100 pF and above 2000 pc reels

**note - MC22, 1000 volt units -680 pF and above 500 pc reels



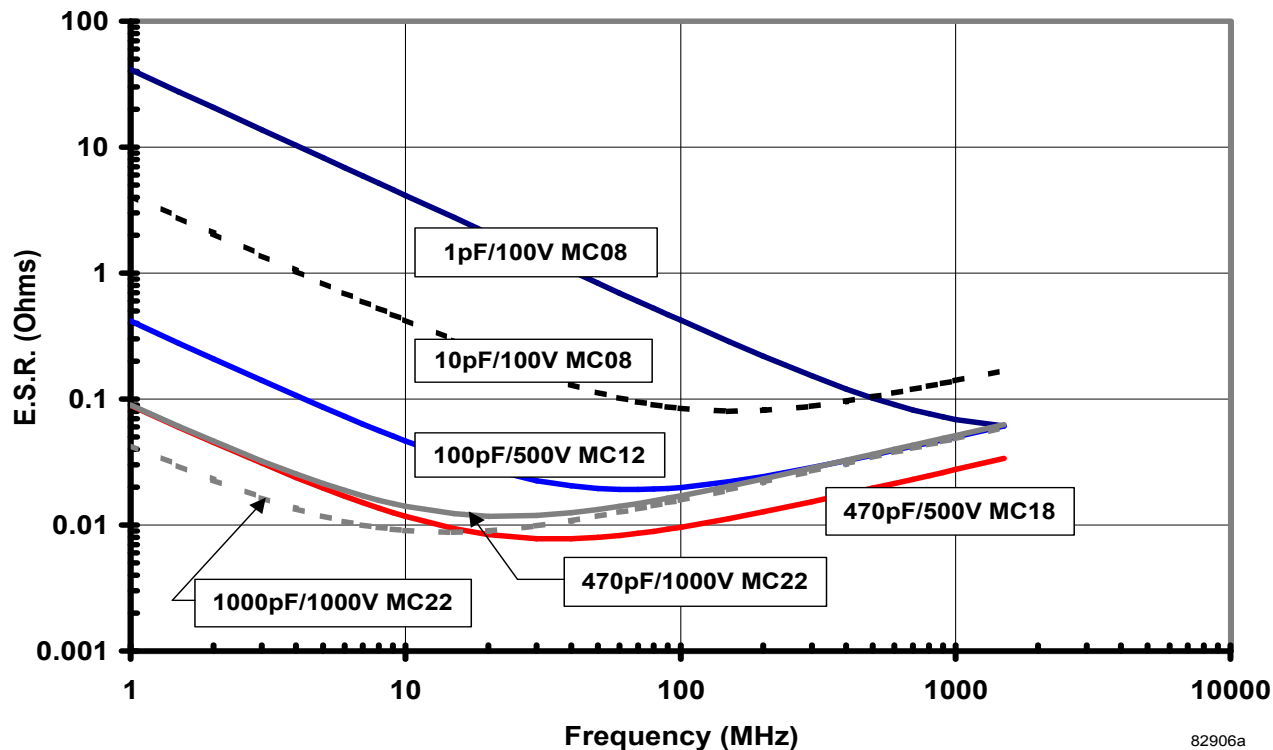
Case Sizes

| Case Code | Case Type | INCHES | | | | MILLIMETERS | | | |
|--------------|--------------|------------------------|------------------------|-------------|----------------|------------------|------------------|-------------|----------------|
| | | L | W | H (Max.) | I Min./Max. | L | W | H (Max.) | I Min./Max. |
| 08 | 0805 | 0.079 +0.02 -0 | 0.049 +0.02 -0 | 0.055 | 0.008/0.035 | 2.0 +0.5 -0 | 1.25 +0.5 -0 | 1.4 | 0.2/0.9 |
| 12 | 1210 | 0.126 +0.024 -0.004 | 0.098 +0.024 -0.004 | 0.079 | 0.012/0.043 | 3.2 +0.6 -0.1 | 2.5 +0.6 -0.1 | 2.0 | 0.3/1.1 |
| 18 | 1812 | 0.177 +0.024 -0.008 | 0.126 +0.024 -0 | 0.079 | 0.012/0.051 | 4.5 +0.6 -0.2 | 3.2 +0.6 -0 | 2.0 | 0.3/1.3 |
| 22 | 2220 | 0.224 +0.016 -0.012 | 0.197 +0.016 -0.012 | 0.079 | 0.012/0.051 | 5.7 +0.4 -0.3 | 5.0 +0.4 -0.3 | 2.0* | 0.3/1.3 |

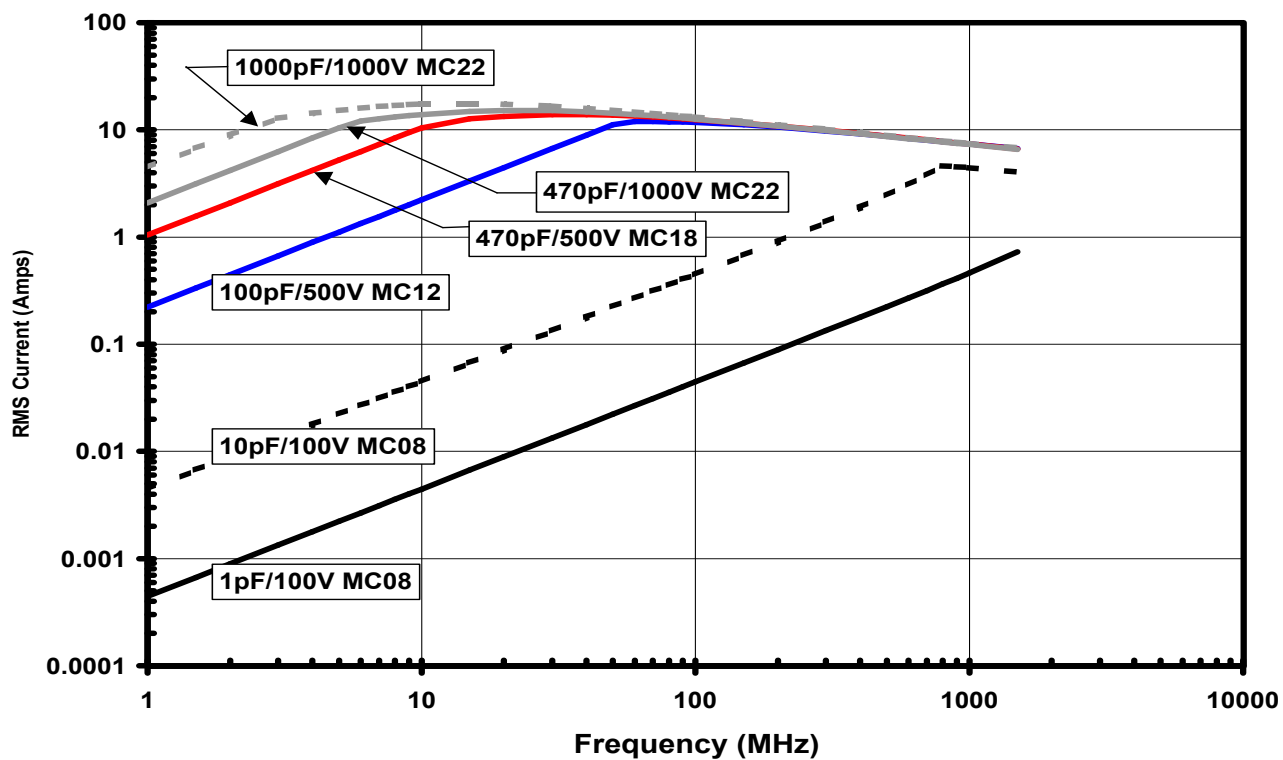
*.157 (4.0 mm) for 1000 V rating

Typical Performance Curves

Type MC Typical ESR vs. Frequency

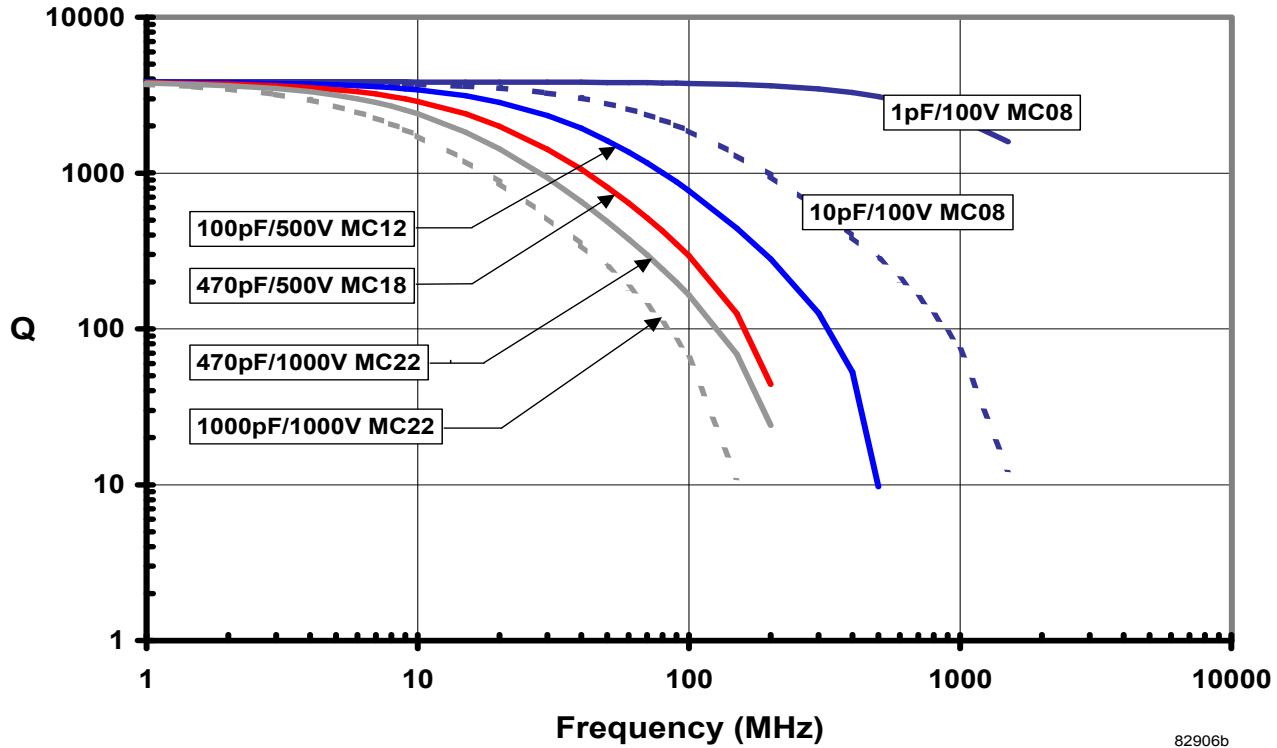


Type MC Maximum RMS Current vs. Frequency

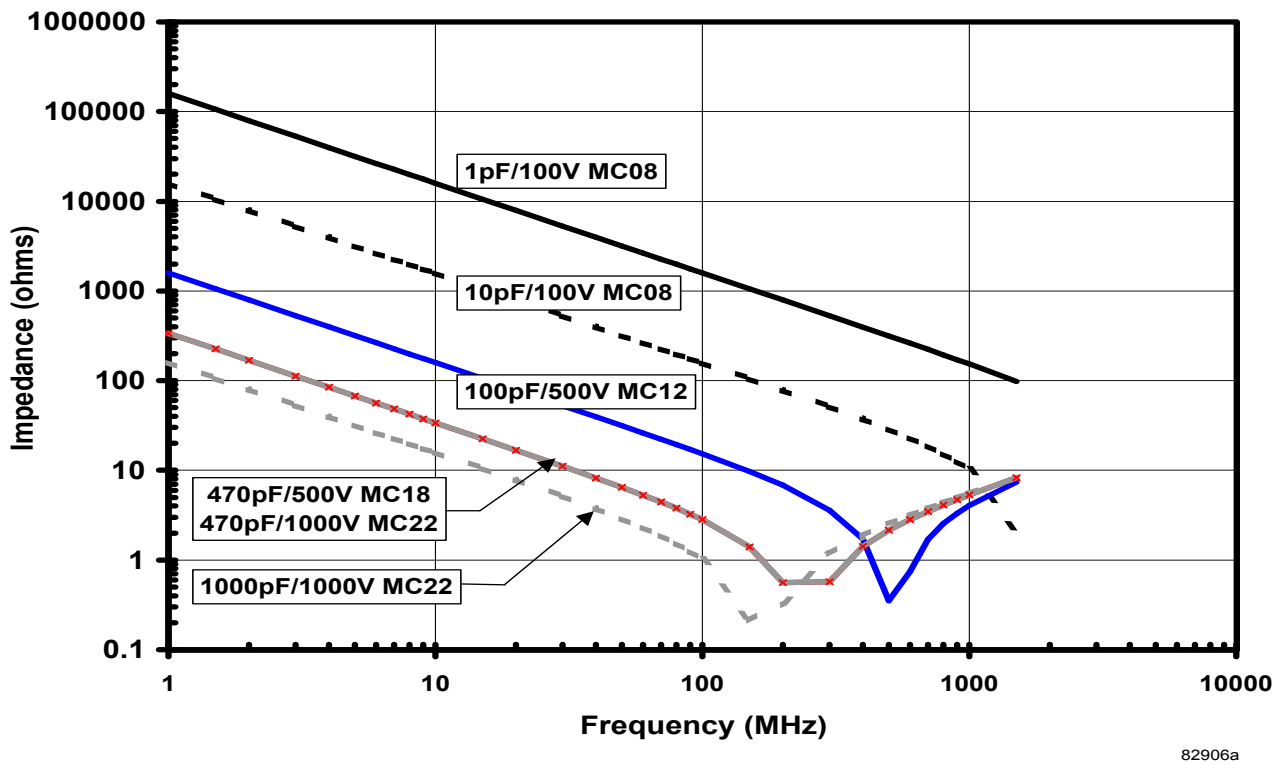


Typical Performance Curves

Type MC Typical Q vs. Frequency

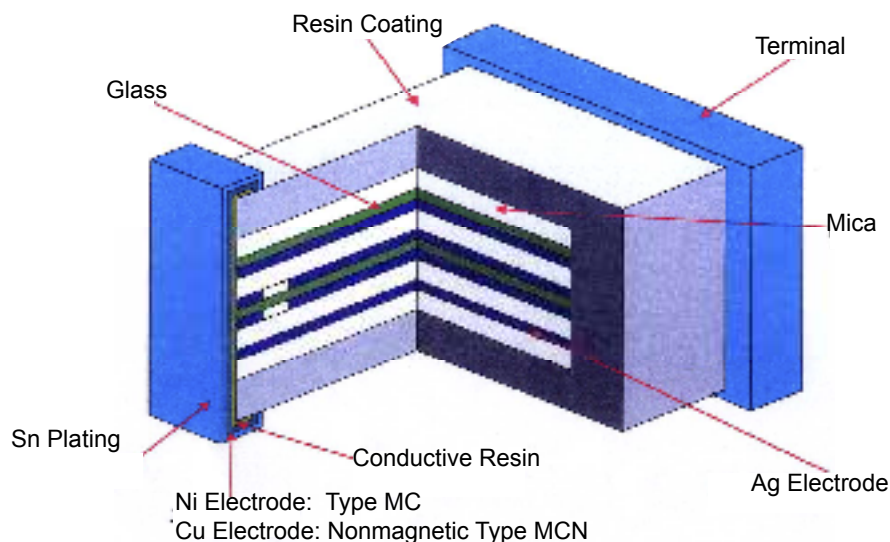


Type MC Typical Impedance vs. Frequency



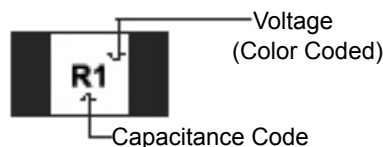
Types MC and MCN Multilayer RF Capacitors

High Q, Low ESR Construction for RF Power Applications



Specifications

Marking



| Base Value | Code Ltr. | Base Value | Code Ltr. |
|------------|-----------|------------|-----------|
| 10 | A | 40 | d |
| 11 | B | 43 | R |
| 12 | C | 45 | e |
| 13 | D | 47 | S |
| 15 | E | 50 | f |
| 16 | F | 51 | T |
| 18 | G | 56 | U |
| 20 | H | 60 | m |
| 22 | J | 62 | V |
| 24 | K | 68 | W |
| 25 | a | 70 | n |
| 27 | L | 75 | X |
| 30 | M | 80 | t |
| 33 | N | 82 | Y |
| 35 | b | 90 | y |
| 36 | P | 91 | Z |
| 39 | Q | | |

Capacitance is within tolerance when measured as follows:

1—1000 pF @ 1 MHz

>1000 pF @ 1 kHz

Dissipation Factor is no more than 0.1% when measured as above at 5 Vrms or less.

| Multiplier | Code No. |
|------------|----------|
| X 0.1 | 0 |
| X 1 | 1 |
| X 10 | 2 |
| X 100 | 3 |
| X 0.01 | 9 |

Example:
R1 = 43 pF

Specifications

Quality Factor (Q) is as follows when measured at 1 MHz

| Capacitance Range | Min. Q |
|-------------------|-------------|
| 1 to 80 pF | 500 to 3000 |
| >80 pF | 3000 |

Insulation Resistance is no less than 100 GΩ when measured at 100 Vdc

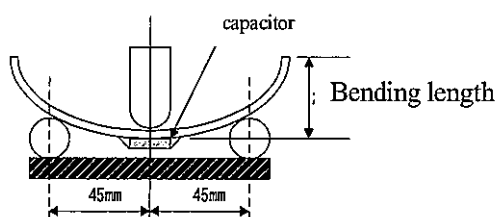
Withstanding voltage is two times the rated voltage between 5 seconds and without damage: with 50 mA or less current.

Life Test: Subject capacitors to 125 °C ±3 °C with 1.5 times rated voltage applied for 2000 (+72, -0) hours. There will be no visual damage and the capacitors will meet the limits of the table below.

Vibration Resistance: Subject the capacitors to simple harmonic motion with an amplitude of 0.06 inches; vary the frequency uniformly from 10 to 55 Hz and return to 10 Hz, all in one minute. Repeat that cycle continuously for two hours in

each of three mutually perpendicular directions. There will be no visual damage and the capacitors will meet the limits of the table below.

Bending Test: Mount the capacitor as shown below and press the ram bar until a 2.0 mm deflection is achieved. There will be no visual damage and the capacitors will meet the limits of methods JIS 5102 8.11 and AEC-Q200-005 without cracking or visual damage.



Temperature Coefficient and Drift: Measure the capacitors' capacitance at 25 °C, -55 °C, 25 °C, 125 °C and at 25 °C — all ±3 °C — after stabilizing at each temperature. The capacitor will meet the limits of the Characteristic table in Ordering Information.

Heat Resistance: Subject the capacitors to 125 ±2 °C for 2 (+1, -0) hours. Then the insulation resistance will be no less than 5GΩ.

Solderability: After 2 ±0.5 seconds in molten solder with Sn-PB between molten and solder at 235 ±5 °C, solder coverage will be no less than 75% when examined at 10X magnification for flow soldering.

Solder Heat Resistance: Subject the capacitors to molten solder at 250 ±5 °C for 5 ±0.5 seconds after 10 to 30 seconds pre-heating at 80 to 120 °C. There will be no visual damage and the capacitors will meet the limits of the table below.

Moisture Resistance: Subject the capacitors to 40 ±2 °C at 90 to 95% humidity for 500 (+24, -0) hours. Return to room ambient for 24 hours. There will be no visual damage and the capacitors will meet the limits of the table below.

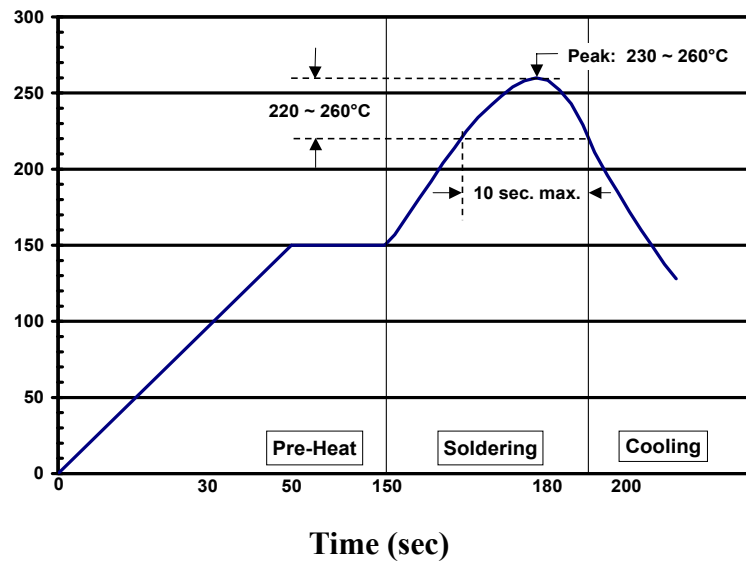
After-Test Limits

| Test | Withstand Voltage | Insulation Resistance | Capacitance (whichever >) | DF | Q |
|----------------------|-------------------|-----------------------|---------------------------|-------------|----------|
| Life Test | IL | IL | IV ±2% or ±.5 pF | 150% max IL | 2/3 x IL |
| Vibration Resistance | IL | 30 GΩ | IV ±1% or ±1 pF | IL | IL |
| Bending Test | IL | | IV ±.5% or ±1 pF | IL | |
| Moisture Res. | IL | 30 GΩ | IV ±3% or ±.5 pF | 150% max IL | 2/3 x IL |
| Solderability | IL | IL | IL | IL | IL |
| Heat Resistance | | 5 GΩ | | | |
| Solder Heat Res. | IL | 30 GΩ | IV ±.5% or ±1 pF | IL | IL |

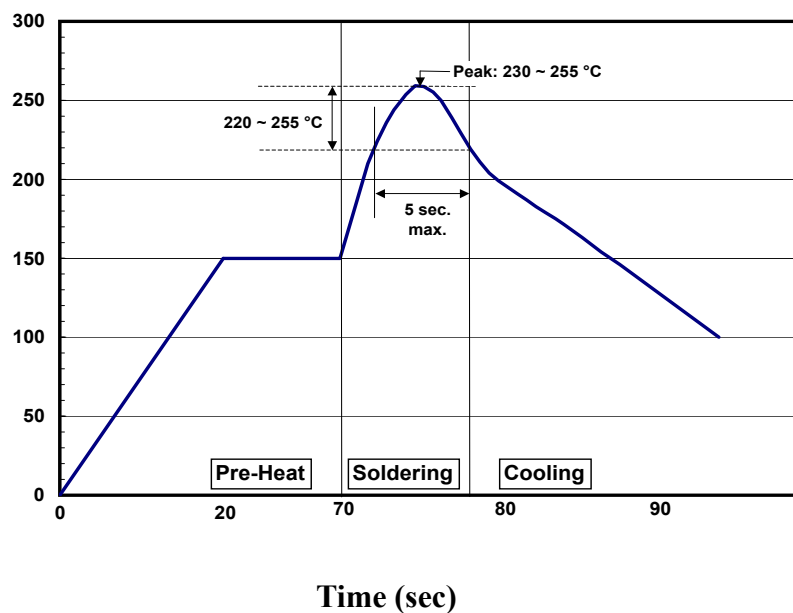
Types MC and MCN Multilayer RF Capacitors

Soldering Profiles

Reflow Solder Profile

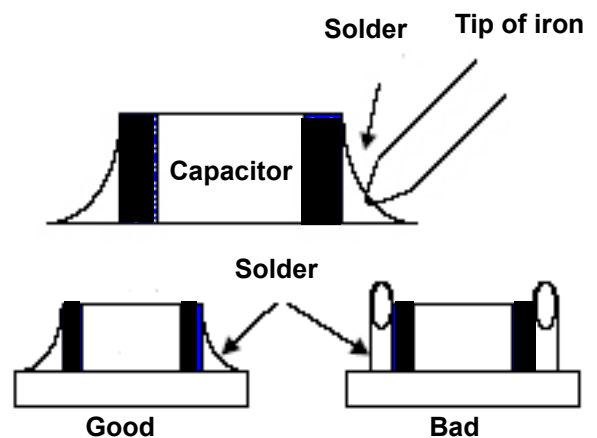


Wave Solder Profile



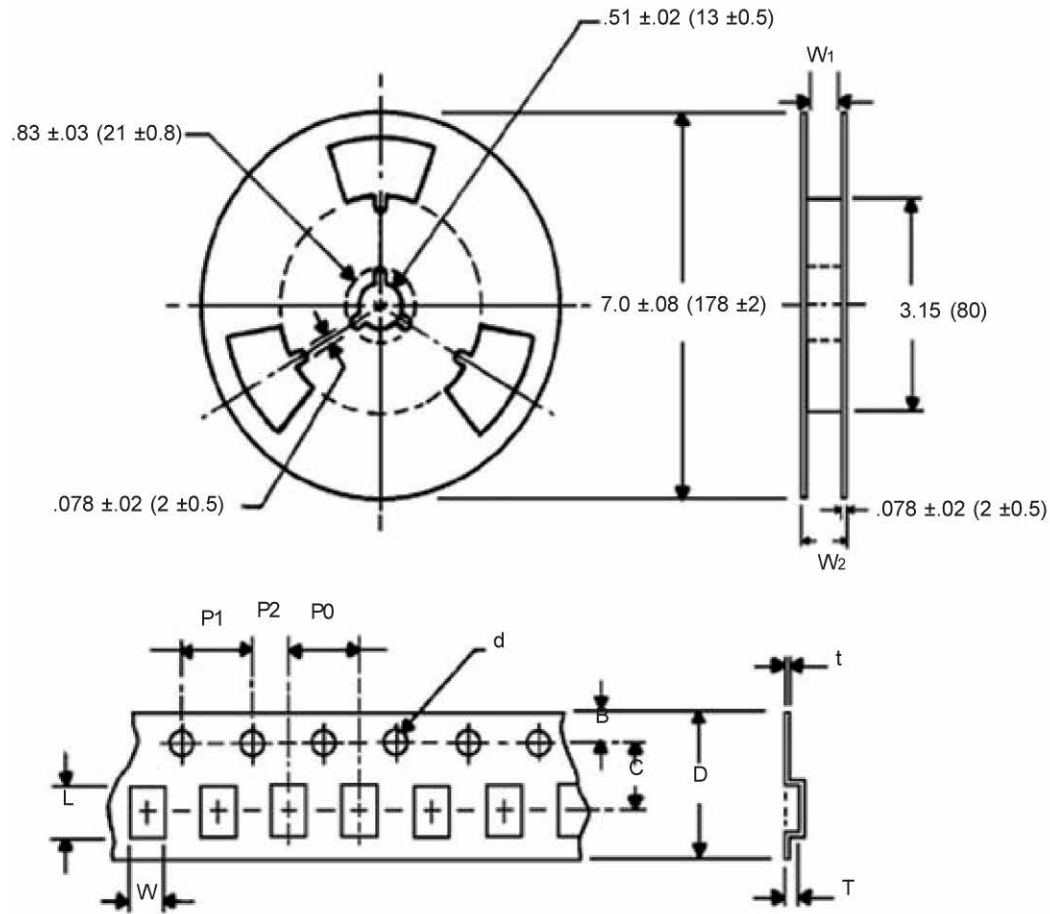
Hand Soldering Method

- SnAgCu recommended solder
- Do not use strong acid type flux with RM or RMA
- Soldering iron tip temperature should be 250 °C to 280 °C ≤ 5 sec.
- 60 Watt iron or less



Types MC and MCN Multilayer RF Capacitors

Surface-Mount Chip Mica Capacitors for Auto Insertion



Carrier Dimensions

| Item | Symbol | Case Code | | | |
|------------------------------|----------------|--------------------------|-------------------------|--------------------------|-------------------------|
| | | 08 | 12 | 18 | 22 |
| Sprocket hole pitch | P1 | .157 ± .008 (4.0 ± 0.2) | | | |
| Sprocket hole location | B | .069 ± .008 (1.75 ± 0.2) | | | |
| Hole center to cavity center | C | .138 ± .002 (3.5 ± 0.05) | | .217 ± .004 (5.5 ± 0.1) | |
| Carrier tape width | D | .315 ± .012 (8.0 ± 0.3) | | .472 ± .012 (12.0 ± 0.3) | |
| Sprocket hole diameter | d | .059 (1.5) | | | |
| Cavity pitch | P ₀ | .157 ± .004 (4.0 ± 0.1) | | .315 ± .008 (8.0 ± 0.2) | |
| Hole center to cavity center | P ₂ | .079 ± .004 (2.0 ± 0.1) | | | |
| Cavity length | L | .110 (2.8) | .150 (3.8) | .205 (5.2) | .246 (6.25) |
| Cavity width | W | .075 ± .008 (1.9 ± 0.2) | .118 ± .008 (3.0 ± 0.2) | .161 ± .008 (4.1 ± 0.2) | .217 ± .008 (5.5 ± 0.2) |
| Cavity depth | T | .051 ± .004 (1.3 ± 0.1) | .059 ± .004 (1.5 ± 0.1) | .071 ± .004 (1.8 ± 0.1) | .087 ± .004 (2.2 ± 0.1) |
| Carrier tape thickness | t | .012 ± .002 (0.3 ± 0.05) | | | |
| Holder distance | W ₁ | .354 (9.0) | | .512 (13.0) | |
| Reel thickness | W ₂ | about .47 (12) | | about .63 (16) | |

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