

# RF/Microwave C0G (NP0) Capacitors (RoHS)



## Ultra Low ESR, "U" Series, C0G (NP0) Chip Capacitors

### GENERAL INFORMATION

"U" Series capacitors are C0G (NP0) chip capacitors specially designed for "Ultra" low ESR for applications in the communications market. Max ESR and effective capacitance

are met on each value producing lot to lot uniformity. Sizes available are EIA chip sizes 0402, 0603, 0805, and 1210.

### DIMENSIONS: inches (millimeters)



| Size | A                       | B                       | C                        | D                         | E                |
|------|-------------------------|-------------------------|--------------------------|---------------------------|------------------|
| 0402 | 0.039±0.004 (1.00±0.1)  | 0.020±0.004 (0.50±0.1)  | 0.024 (0.6) max          | N/A                       | N/A              |
| 0603 | 0.060±0.010 (1.52±0.25) | 0.030±0.010 (0.76±0.25) | 0.036 (0.91) max         | 0.010±0.005 (0.25±0.13)   | 0.030 (0.76) min |
| 0805 | 0.079±0.008 (2.01±0.2)  | 0.049±0.008 (1.25±0.2)  | 0.040±0.005 (1.02±0.127) | 0.020±0.010 (0.51±0.255)  | 0.020 (0.51) min |
| 1210 | 0.126±0.008 (3.2±0.2)   | 0.098±0.008 (2.49±0.2)  | 0.050±0.005 (1.27±0.127) | 0.025±0.015 (0.635±0.381) | 0.040 (1.02) min |

### HOW TO ORDER



NOTE: Contact factory for availability of Termination and Tolerance Options for Specific Part Numbers.

### ELECTRICAL CHARACTERISTICS

#### Capacitance Values and Tolerances:

Size 0402 - 0.2 pF to 22 pF @ 1 MHz  
Size 0603 - 1.0 pF to 100 pF @ 1 MHz  
Size 0805 - 1.6 pF to 160 pF @ 1 MHz  
Size 1210 - 2.4 pF to 1000 pF @ 1 MHz

#### Temperature Coefficient of Capacitance (TC):

0±30 ppm/°C (-55° to +125°C)

#### Insulation Resistance (IR):

10<sup>12</sup> Ω min. @ 25°C and rated WVDC  
10<sup>11</sup> Ω min. @ 125°C and rated WVDC

#### Working Voltage (WVDC):

Size Working Voltage  
0402 - 50, 25 WVDC  
0603 - 200, 100, 50 WVDC  
0805 - 200, 100 WVDC  
1210 - 200, 100 WVDC

#### Dielectric Working Voltage (DWV):

250% of rated WVDC

#### Equivalent Series Resistance Typical (ESR):

0402 - See Performance Curve, page 9  
0603 - See Performance Curve, page 9  
0805 - See Performance Curve, page 9  
1210 - See Performance Curve, page 9

#### Marking: Laser marking EIA J marking standard

(except 0603) (capacitance code and tolerance upon request).

#### MILITARY SPECIFICATIONS

Meets or exceeds the requirements of MIL-C-55681



# RF/Microwave C0G (NP0) Capacitors (RoHS)



## Ultra Low ESR, “U” Series, C0G (NP0) Chip Capacitors

### CAPACITANCE RANGE

| Cap (pF) | Available | Size |      |      |      |
|----------|-----------|------|------|------|------|
|          | Tolerance | 0402 | 0603 | 0805 | 1210 |
| 0.2      | B, C      | 50V  | N/A  | N/A  | N/A  |
| 0.3      |           |      |      |      |      |
| 0.4      |           |      |      |      |      |
| 0.5      | B, C      |      |      |      |      |
| 0.6      | B, C, D   |      |      |      |      |
| 0.7      |           |      |      |      |      |
| 0.8      |           |      |      |      |      |
| 0.9      | B, C, D   |      |      |      |      |

| Cap (pF) | Available     | Size |      |      |      |
|----------|---------------|------|------|------|------|
|          | Tolerance     | 0402 | 0603 | 0805 | 1210 |
| 1.0      | B, C, D       | 50V  | 200V | 200V | 200V |
| 1.1      |               |      |      |      |      |
| 1.2      |               |      |      |      |      |
| 1.3      |               |      |      |      |      |
| 1.4      |               |      |      |      |      |
| 1.5      |               |      |      |      |      |
| 1.6      |               |      |      |      |      |
| 1.7      |               |      |      |      |      |
| 1.8      |               |      |      |      |      |
| 1.9      |               |      |      |      |      |
| 2.0      |               |      |      |      |      |
| 2.1      |               |      |      |      |      |
| 2.2      |               |      |      |      |      |
| 2.4      |               |      |      |      |      |
| 2.7      |               |      |      |      |      |
| 3.0      |               |      |      |      |      |
| 3.3      |               |      |      |      |      |
| 3.6      |               |      |      |      |      |
| 3.9      |               |      |      |      |      |
| 4.3      |               |      |      |      |      |
| 4.7      |               |      |      |      |      |
| 5.1      |               |      |      |      |      |
| 5.6      |               |      |      |      |      |
| 6.2      | B, C, D       |      |      |      |      |
| 6.8      | B, C, J, K, M |      |      |      |      |

| Cap (pF) | Available     | Size |      |      |      |
|----------|---------------|------|------|------|------|
|          | Tolerance     | 0402 | 0603 | 0805 | 1210 |
| 7.5      | B, C, J, K, M | 50V  | 200V | 200V | 200V |
| 8.2      |               |      |      |      |      |
| 9.1      |               |      |      |      |      |
| 10       | B, C, J, K, M |      |      |      |      |
| 11       | F, G, J, K, M |      |      |      |      |
| 12       |               |      |      |      |      |
| 13       |               |      |      |      |      |
| 15       |               |      |      |      |      |
| 18       |               |      |      |      |      |
| 20       |               |      |      |      |      |
| 22       |               |      |      |      |      |
| 24       |               |      |      |      |      |
| 27       |               |      |      |      |      |
| 30       |               |      |      |      |      |
| 33       |               |      |      |      |      |
| 36       |               |      |      |      |      |
| 39       |               |      |      |      |      |
| 43       |               |      |      |      |      |
| 47       |               |      |      |      |      |
| 51       |               |      |      |      |      |
| 56       |               |      |      |      |      |
| 68       |               |      |      |      |      |
| 75       |               |      |      |      |      |
| 82       |               |      |      |      |      |
| 91       |               |      |      |      |      |

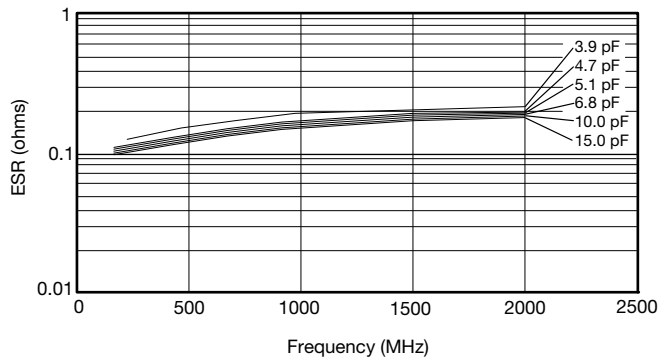
| Cap (pF) | Available     | Size |      |      |      |
|----------|---------------|------|------|------|------|
|          | Tolerance     | 0402 | 0603 | 0805 | 1210 |
| 100      | F, G, J, K, M | N/A  | 100V | 200V | 200V |
| 110      |               |      |      |      |      |
| 120      |               |      |      |      |      |
| 130      |               |      |      |      |      |
| 140      |               |      |      |      |      |
| 150      |               |      |      |      |      |
| 160      |               |      |      |      |      |
| 180      |               |      |      |      |      |
| 200      |               |      |      |      |      |
| 220      |               |      |      |      |      |
| 270      |               |      |      |      |      |
| 300      |               |      |      |      |      |
| 330      |               |      |      |      |      |
| 360      |               |      |      |      |      |
| 390      |               |      |      |      |      |
| 430      |               |      |      |      |      |
| 470      |               |      |      |      |      |
| 510      |               |      |      |      |      |
| 560      |               |      |      |      |      |
| 620      |               |      |      |      |      |
| 680      |               |      |      |      |      |
| 750      |               |      |      |      |      |
| 820      |               |      |      |      |      |
| 910      |               |      |      |      |      |
| 1000     | F, G, J, K, M |      |      |      |      |

### ULTRA LOW ESR, “U” SERIES

TYPICAL ESR vs. FREQUENCY  
0402 “U” SERIES



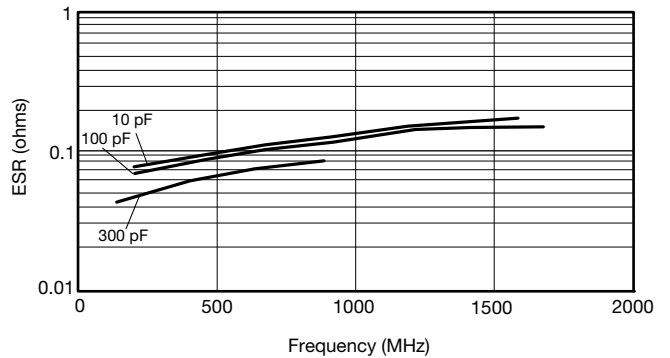
TYPICAL ESR vs. FREQUENCY  
0603 “U” SERIES



TYPICAL ESR vs. FREQUENCY  
0805 “U” SERIES



TYPICAL ESR vs. FREQUENCY  
1210 “U” SERIES



ESR Measured on the Boonton 34A



# RF/Microwave C0G (NP0) Capacitors



Ultra Low ESR, “U” Series, C0G (NP0) Chip Capacitors



# RF/Microwave C0G (NP0) Capacitors (Sn/Pb)

## Ultra Low ESR, "U" Series, C0G (NP0) Chip Capacitors

### GENERAL INFORMATION

"U" Series capacitors are C0G (NP0) chip capacitors specially designed for "Ultra" low ESR for applications in the communications market. Max ESR and effective capacitance

are met on each value producing lot to lot uniformity. Sizes available are EIA chip sizes 0402, 0603, 0805, and 1210.

### DIMENSIONS: inches (millimeters)

| Size | A                       | B                       | C                        | D                         | E                |
|------|-------------------------|-------------------------|--------------------------|---------------------------|------------------|
| 0402 | 0.039±0.004 (1.00±0.1)  | 0.020±0.004 (0.50±0.1)  | 0.024 (0.6) max          | N/A                       | N/A              |
| 0603 | 0.060±0.010 (1.52±0.25) | 0.030±0.010 (0.76±0.25) | 0.036 (0.91) max         | 0.010±0.005 (0.25±0.13)   | 0.030 (0.76) min |
| 0805 | 0.079±0.008 (2.01±0.2)  | 0.049±0.008 (1.25±0.2)  | 0.040±0.005 (1.02±0.127) | 0.020±0.010 (0.51±0.254)  | 0.020 (0.51) min |
| 1210 | 0.126±0.008 (3.2±0.2)   | 0.098±0.008 (2.49±0.2)  | 0.050±0.005 (1.27±0.127) | 0.025±0.015 (0.635±0.381) | 0.040 (1.02) min |

### HOW TO ORDER

|                                                                                             |                                                                               |                                               |                                                                                                                                                                                                        |                                                                                                                                                   |                                                            |                                                   |                                                                              |                                                 |
|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|---------------------------------------------------|------------------------------------------------------------------------------|-------------------------------------------------|
| <b>LD05</b><br><b>Case Size</b><br>LD02 = 0402<br>LD03 = 0603<br>LD05 = 0805<br>LD10 = 1210 | <b>1</b><br><b>Voltage Code</b><br>3 = 25V<br>5 = 50V<br>1 = 100V<br>2 = 200V | <b>U</b><br><b>Dielectric = Ultra Low ESR</b> | <b>100</b><br><b>Capacitance</b><br>EIA Capacitance Code in pF.<br>First two digits = significant figures or "R" for decimal place.<br>Third digit = number of zeros or after "R" significant figures. | <b>J</b><br><b>Capacitance Tolerance Code</b><br>B = ±0.1pF<br>C = ±0.25pF<br>D = ±0.5pF<br>F = ±1%<br>G = ±2%<br>J = ±5%<br>K = ±10%<br>M = ±20% | <b>A</b><br><b>Failure Rate Code</b><br>A = Not Applicable | <b>B</b><br><b>Termination</b><br>B = 5% min lead | <b>2</b><br><b>Packaging Code</b><br>2 = 7" Reel<br>4 = 13" Reel<br>9 = Bulk | <b>A</b><br><b>Special Code</b><br>A = Standard |
|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|---------------------------------------------------|------------------------------------------------------------------------------|-------------------------------------------------|

### ELECTRICAL CHARACTERISTICS

#### Capacitance Values and Tolerances:

Size 0402 - 0.2 pF to 22 pF @ 1 MHz  
 Size 0603 - 1.0 pF to 100 pF @ 1 MHz  
 Size 0805 - 1.6 pF to 160 pF @ 1 MHz  
 Size 1210 - 2.4 pF to 1000 pF @ 1 MHz

#### Temperature Coefficient of Capacitance (TC):

0±30 ppm/°C (-55° to +125°C)

#### Insulation Resistance (IR):

10<sup>12</sup> Ω min. @ 25°C and rated WVDC  
 10<sup>11</sup> Ω min. @ 125°C and rated WVDC

#### Working Voltage (WVDC):

Size Working Voltage  
 0402 - 50, 25 WVDC  
 0603 - 200, 100, 50 WVDC  
 0805 - 200, 100 WVDC  
 1210 - 200, 100 WVDC

#### Dielectric Working Voltage (DWV):

250% of rated WVDC

#### Equivalent Series Resistance Typical (ESR):

0402 - See Performance Curve, page 12  
 0603 - See Performance Curve, page 12  
 0805 - See Performance Curve, page 12  
 1210 - See Performance Curve, page 12

**Marking:** Laser marking EIA J marking standard (except 0603) (capacitance code and tolerance upon request).

#### MILITARY SPECIFICATIONS

Meets or exceeds the requirements of MIL-C-55681

**Not RoHS Compliant**

# RF/Microwave C0G (NP0) Capacitors (Sn/Pb)



## Ultra Low ESR, "U" Series, C0G (NP0) Chip Capacitors

### CAPACITANCE RANGE

| Cap (pF) | Available Tolerance | Size |      |      |      |
|----------|---------------------|------|------|------|------|
|          |                     | LD02 | LD03 | LD05 | LD10 |
| 0.2      | B,C                 | 50V  | N/A  | N/A  | N/A  |
| 0.3      |                     |      |      |      |      |
| 0.4      |                     |      |      |      |      |
| 0.5      | B,C                 |      |      |      |      |
| 0.6      | B,C,D               |      |      |      |      |
| 0.7      |                     |      |      |      |      |
| 0.8      |                     |      |      |      |      |
| 0.9      | B,C,D               |      |      |      |      |

| Cap (pF) | Available Tolerance | Size |      |      |      |
|----------|---------------------|------|------|------|------|
|          |                     | LD02 | LD03 | LD05 | LD10 |
| 1.0      | B,C,D               | 50V  | 200V | 200V | 200V |
| 1.1      |                     |      |      |      |      |
| 1.2      |                     |      |      |      |      |
| 1.3      |                     |      |      |      |      |
| 1.4      |                     |      |      |      |      |
| 1.5      |                     |      |      |      |      |
| 1.6      |                     |      |      |      |      |
| 1.7      |                     |      |      |      |      |
| 1.8      |                     |      |      |      |      |
| 1.9      |                     |      |      |      |      |
| 2.0      |                     |      |      |      |      |
| 2.1      |                     |      |      |      |      |
| 2.2      |                     |      |      |      |      |
| 2.4      |                     |      |      |      |      |
| 2.7      |                     |      |      |      |      |
| 3.0      |                     |      |      |      |      |
| 3.3      |                     |      |      |      |      |
| 3.6      |                     |      |      |      |      |
| 3.9      |                     |      |      |      |      |
| 4.3      |                     |      |      |      |      |
| 4.7      |                     |      |      |      |      |
| 5.1      |                     |      |      |      |      |
| 5.6      |                     |      |      |      |      |
| 6.2      | B,C,D               |      |      |      |      |
| 6.8      | B,C,J,K,M           |      |      |      |      |

| Cap (pF) | Available Tolerance | Size |      |      |      |
|----------|---------------------|------|------|------|------|
|          |                     | LD02 | LD03 | LD05 | LD10 |
| 7.5      | B,C,J,K,M           | 50V  | 200V | 200V | 200V |
| 8.2      |                     |      |      |      |      |
| 9.1      | B,C,J,K,M           |      |      |      |      |
| 10       | F,G,J,K,M           |      |      |      |      |
| 11       |                     |      |      |      |      |
| 12       |                     |      |      |      |      |
| 13       |                     |      |      |      |      |
| 15       |                     |      |      |      |      |
| 18       |                     |      |      |      |      |
| 20       |                     |      |      |      |      |
| 22       |                     |      |      |      |      |
| 24       |                     |      |      |      |      |
| 27       |                     |      |      |      |      |
| 30       |                     |      |      |      |      |
| 33       |                     |      |      |      |      |
| 36       |                     |      |      |      |      |
| 39       |                     |      |      |      |      |
| 43       |                     |      |      |      |      |
| 47       |                     |      |      |      |      |
| 51       |                     |      |      |      |      |
| 56       |                     |      |      |      |      |
| 68       |                     |      |      |      |      |
| 75       |                     |      |      |      |      |
| 82       |                     |      |      |      |      |
| 91       |                     |      |      |      |      |

| Cap (pF) | Available Tolerance | Size |      |      |      |
|----------|---------------------|------|------|------|------|
|          |                     | LD02 | LD03 | LD05 | LD10 |
| 100      | F,G,J,K,M           | N/A  | 100V | 200V | 200V |
| 110      |                     |      | 50V  |      |      |
| 120      |                     |      | 50V  |      |      |
| 130      |                     |      | N/A  |      |      |
| 140      |                     |      |      |      |      |
| 150      |                     |      |      |      |      |
| 160      |                     |      |      |      |      |
| 180      |                     |      |      |      |      |
| 200      |                     |      |      |      |      |
| 220      |                     |      |      |      |      |
| 270      |                     |      |      |      |      |
| 300      |                     |      |      |      |      |
| 330      |                     |      |      |      |      |
| 360      |                     |      |      |      |      |
| 390      |                     |      |      |      |      |
| 430      |                     |      |      |      |      |
| 470      |                     |      |      |      |      |
| 510      |                     |      |      |      |      |
| 560      |                     |      |      |      |      |
| 620      |                     |      |      |      |      |
| 680      |                     |      |      |      |      |
| 750      |                     |      |      |      |      |
| 820      |                     |      |      |      |      |
| 910      |                     |      |      |      |      |
| 1000     | F,G,J,K,M           |      |      |      |      |

### ULTRA LOW ESR, "U" SERIES

TYPICAL ESR vs. FREQUENCY  
0402 "U" SERIES



TYPICAL ESR vs. FREQUENCY  
0603 "U" SERIES



TYPICAL ESR vs. FREQUENCY  
0805 "U" SERIES



TYPICAL ESR vs. FREQUENCY  
1210 "U" SERIES



ESR Measured on the Boonton 34A

### “U” SERIES KITS

#### 0402

| Kit 5000 UZ   |                          |               |                          |
|---------------|--------------------------|---------------|--------------------------|
| Cap. Value pF | Tolerance                | Cap. Value pF | Tolerance                |
| 0.5           | B ( $\pm 0.1\text{pF}$ ) | 4.7           | B ( $\pm 0.1\text{pF}$ ) |
| 1.0           |                          | 5.6           |                          |
| 1.5           |                          | 6.8           |                          |
| 1.8           |                          | 8.2           |                          |
| 2.2           |                          | 10.0          | J ( $\pm 5\%$ )          |
| 2.4           |                          | 12.0          |                          |
| 3.0           |                          | 15.0          |                          |
| 3.6           |                          |               |                          |

\*\*\*25 each of 15 values

#### 0603

| Kit 4000 UZ   |                          |               |                          |
|---------------|--------------------------|---------------|--------------------------|
| Cap. Value pF | Tolerance                | Cap. Value pF | Tolerance                |
| 1.0           | B ( $\pm 0.1\text{pF}$ ) | 6.8           | B ( $\pm 0.1\text{pF}$ ) |
| 1.2           |                          | 7.5           |                          |
| 1.5           |                          | 8.2           |                          |
| 1.8           |                          | 10.0          | J ( $\pm 5\%$ )          |
| 2.0           |                          | 12.0          |                          |
| 2.4           |                          | 15.0          |                          |
| 2.7           |                          | 18.0          |                          |
| 3.0           |                          | 22.0          |                          |
| 3.3           |                          | 27.0          |                          |
| 3.9           |                          | 33.0          |                          |
| 4.7           |                          | 39.0          |                          |
| 5.6           |                          | 47.0          |                          |

\*\*\*25 each of 24 values

#### 0805

| Kit 3000 UZ   |                          |               |                 |
|---------------|--------------------------|---------------|-----------------|
| Cap. Value pF | Tolerance                | Cap. Value pF | Tolerance       |
| 1.0           | B ( $\pm 0.1\text{pF}$ ) | 15.0          | J ( $\pm 5\%$ ) |
| 1.5           |                          | 18.0          |                 |
| 2.2           |                          | 22.0          |                 |
| 2.4           |                          | 24.0          |                 |
| 2.7           |                          | 27.0          |                 |
| 3.0           |                          | 33.0          |                 |
| 3.3           |                          | 36.0          |                 |
| 3.9           |                          | 39.0          |                 |
| 4.7           |                          | 47.0          |                 |
| 5.6           |                          | 56.0          |                 |
| 7.5           |                          | 68.0          |                 |
| 8.2           |                          | 82.0          |                 |
| 9.1           |                          | 100.0         |                 |
| 10.0          | J ( $\pm 5\%$ )          | 130.0         |                 |
| 12.0          |                          | 160.0         |                 |

\*\*\*25 each of 30 values

#### 1210

| Kit 3500 UZ   |                          |               |                 |
|---------------|--------------------------|---------------|-----------------|
| Cap. Value pF | Tolerance                | Cap. Value pF | Tolerance       |
| 2.2           | B ( $\pm 0.1\text{pF}$ ) | 36.0          | J ( $\pm 5\%$ ) |
| 2.7           |                          | 39.0          |                 |
| 4.7           |                          | 47.0          |                 |
| 5.1           |                          | 51.0          |                 |
| 6.8           |                          | 56.0          |                 |
| 8.2           |                          | 68.0          |                 |
| 9.1           |                          | 82.0          |                 |
| 10.0          | J ( $\pm 5\%$ )          | 100.0         |                 |
| 13.0          |                          | 120.0         |                 |
| 15.0          |                          | 130.0         |                 |
| 18.0          |                          | 240.0         |                 |
| 20.0          |                          | 300.0         |                 |
| 24.0          |                          | 390.0         |                 |
| 27.0          |                          | 470.0         |                 |
| 30.0          |                          | 680.0         |                 |

\*\*\*25 each of 30 values