

# RF/Microwave Capacitors

## RF/Microwave C0G (NP0) Capacitors

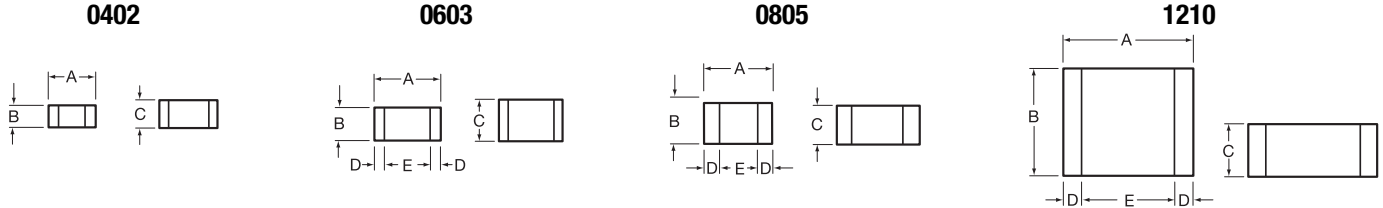
### Ultra Low ESR "U" Series, C0G (NP0) Capacitors (RoHS), KGQ Series



#### 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 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    | 0.010 ± 0.006 (0.25 ± 0.15)   | 0.014 (0.36) min |
| 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)  | 0.045 (1.15mm) max | 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)  | 0.055 (1.40mm) max | 0.025 ± 0.015 (0.635 ± 0.381) | 0.040 (1.02) min |

#### HOW TO ORDER

| KGQ                                                    | 05                                                              | F                                 | CG                            | 1H                                                   | 9R1                                                                                                                                | B                                                                                                                                                            | N                                   |
|--------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------|-------------------------------|------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| <b>Series</b><br>General Purpose<br>Tin/ Nickel Finish | <b>Size</b><br>05 = 0402<br>15 = 0603<br>21 = 0805<br>32 = 1210 | <b>Thickness</b><br>See Cap Chart | <b>Dielectric</b><br>C0G = CG | <b>Voltage</b><br>1H = 50V<br>2A = 100V<br>2D = 200V | <b>Capacitance<br/>Code Code (in pF)</b><br>2 Significant Digits<br>+Number of zeros<br>eg. 10µF = 106<br>10nF = 103<br>47pF = 470 | <b>Capacitance<br/>Tolerance</b><br>B = ± 0.1pF(<10pF)<br>C = ± 0.25pF(<10pF)<br>D = ± 0.5pF(<10pF)<br>G = ±2%<br>F = ±1%<br>J = ±5%<br>K = ±10%<br>M = ±20% | <b>Packaging</b><br>See Table Below |



#### PACKAGING CODES

| Code | EIA (inch) | IEC(mm) | 7" Paper | 7" Embossed | 13" Paper | 13" Embossed |
|------|------------|---------|----------|-------------|-----------|--------------|
| 05   | 0402       | 1005    | H        |             | N         |              |
| 15   | 0603       | 1608    | T        |             | M         |              |
| 21   | 0805       | 2012    | T        |             | M         |              |
| 32   | 1210       | 3225    | T        |             | M         |              |

#### 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 300

0603 - See Performance Curve, page 300

0805 - See Performance Curve, page 300

1210 - See Performance Curve, page 300

##### Marking

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



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TDS-RFM-0085 | Rev 1

— RF MICROWAVE PRODUCTS —

CAPACITANCE RANGE

| SIZE         |       | 0402          |   |   | 0603          |     |     | 0805          |     |     | 1210          |     |     |
|--------------|-------|---------------|---|---|---------------|-----|-----|---------------|-----|-----|---------------|-----|-----|
| Soldering    |       | All Paper     |   |   | All Paper     |     |     | All Embossed  |     |     | All Embossed  |     |     |
| (L) Length   | mm    | 1.00±0.10     |   |   | 1.60±0.15     |     |     | 2.01±0.20     |     |     | 3.20±0.20     |     |     |
|              | (in.) | (0.040±0.004) |   |   | (0.063±0.006) |     |     | (0.079±0.008) |     |     | (0.126±0.008) |     |     |
| (W) Width    | mm    | 0.50±0.10     |   |   | 0.81±0.15     |     |     | 1.25±0.20     |     |     | 2.50±0.20     |     |     |
|              | (in.) | (0.020±0.004) |   |   | (0.032±0.006) |     |     | (0.049±0.008) |     |     | (0.098±0.008) |     |     |
| (t) Terminal | mm    | 0.25±0.15     |   |   | 0.35±0.15     |     |     | 0.50±0.25     |     |     | 0.50±0.25     |     |     |
|              | (in.) | (0.010±0.006) |   |   | (0.014±0.006) |     |     | (0.020±0.010) |     |     | (0.020±0.010) |     |     |
| WVDC         |       | 50            |   |   | 50            | 100 | 200 | 100           | 200 | 100 | 200           | 100 | 200 |
| Cap (pF)     | 0.2   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 0.3   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 0.4   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 0.5   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 0.6   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 0.7   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 0.8   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 0.9   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 1.0   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 1.1   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 1.2   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 1.3   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 1.4   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 1.5   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 1.6   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 1.7   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 1.8   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 1.9   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 2.0   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 2.1   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 2.2   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 2.4   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 2.7   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 3.0   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 3.3   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 3.6   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 3.9   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 4.3   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 4.7   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 5.1   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 5.6   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 6.2   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 6.8   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 7.5   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 8.2   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 9.1   | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 10    | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 11    | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 12    | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 18    | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 20    | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 22    | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
| WVDC         |       | 50            |   |   | 50            | 100 | 200 | 100           | 200 | 100 | 200           | 100 | 200 |
| SIZE         |       | 0402          |   |   | 0603          |     |     | 0805          |     |     | 1210          |     |     |

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| Soldering    |       | All Paper     |   |   | All Paper     |     |     | All Embossed  |     |     | All Embossed  |     |     |
| (L) Length   | mm    | 1.00±0.10     |   |   | 1.60±0.15     |     |     | 2.01±0.20     |     |     | 3.20±0.20     |     |     |
|              | (in.) | (0.040±0.004) |   |   | (0.063±0.006) |     |     | (0.079±0.008) |     |     | (0.126±0.008) |     |     |
| (W) Width    | mm    | 0.50±0.10     |   |   | 0.81±0.15     |     |     | 1.25±0.20     |     |     | 2.50±0.20     |     |     |
|              | (in.) | (0.020±0.004) |   |   | (0.032±0.006) |     |     | (0.049±0.008) |     |     | (0.098±0.008) |     |     |
| (t) Terminal | mm    | 0.25±0.15     |   |   | 0.35±0.15     |     |     | 0.50±0.25     |     |     | 0.50±0.25     |     |     |
|              | (in.) | (0.010±0.006) |   |   | (0.014±0.006) |     |     | (0.020±0.010) |     |     | (0.020±0.010) |     |     |
| WVDC         |       | 50            |   |   | 50            | 100 | 200 | 100           | 200 | 100 | 200           | 100 | 200 |
| Cap (pF)     | 24    | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 27    | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 30    | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 33    | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 36    | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 39    | F             | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 43    |               | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 47    |               | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 51    |               | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 56    |               | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 68    |               | A | A | A             | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 75    |               | A | A |               | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 82    |               | A | A |               | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 91    |               | A | A |               | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 100   |               | A | A |               | H   | H   | D             | D   | D   | D             | D   | D   |
|              | 110   |               |   |   |               |     |     | D             | D   | D   | D             | D   | D   |
|              | 120   |               |   |   |               |     |     | D             | D   | D   | D             | D   | D   |
|              | 130   |               |   |   |               |     |     | D             | D   | D   | D             | D   | D   |
|              | 140   |               |   |   |               |     |     | D             | D   | D   | D             | D   | D   |
|              | 150   |               |   |   |               |     |     | D             | D   | D   | D             | D   | D   |
|              | 160   |               |   |   |               |     |     | D             | D   | D   | D             | D   | D   |
|              | 180   |               |   |   |               |     |     | D             | D   | D   | D             | D   | D   |
|              | 200   |               |   |   |               |     |     | D             | D   | D   | D             | D   | D   |
|              | 220   |               |   |   |               |     |     | D             | D   | D   | D             | D   | D   |
|              | 270   |               |   |   |               |     |     | D             | D   | D   | D             | D   | D   |
|              | 300   |               |   |   |               |     |     | D             | D   | D   | D             | D   | D   |
|              | 330   |               |   |   |               |     |     | D             | D   | D   | D             | D   | D   |
|              | 360   |               |   |   |               |     |     | D             | D   | D   | D             | D   | D   |
|              | 390   |               |   |   |               |     |     | D             | D   | D   | D             | D   | D   |
|              | 430   |               |   |   |               |     |     | D             | D   | D   | D             | D   | D   |
|              | 470   |               |   |   |               |     |     | D             | D   | D   | D             | D   | D   |
|              | 510   |               |   |   |               |     |     | D             | D   | D   | D             | D   | D   |
|              | 560   |               |   |   |               |     |     | D             | D   | D   | D             | D   | D   |
|              | 620   |               |   |   |               |     |     | D             | D   | D   | D             | D   | D   |
|              | 680   |               |   |   |               |     |     | D             | D   | D   | D             | D   | D   |
|              | 750   |               |   |   |               |     |     | D             | D   | D   | D             | D   | D   |
|              | 820   |               |   |   |               |     |     | D             | D   | D   | D             | D   | D   |
|              | 910   |               |   |   |               |     |     | D             | D   | D   | D             | D   | D   |
|              | 1000  |               |   |   |               |     |     | D             | D   | D   | D             | D   | D   |
| WVDC         |       | 50            |   |   | 50            | 100 | 200 | 100           | 200 | 100 | 200           | 100 | 200 |
| SIZE         |       | 0402          |   |   | 0603          |     |     | 0805          |     |     | 1210          |     |     |

| Case Size              | 0402 (KGQ05) | 0603 (KGQ15) | 0805 (KGQ21) | 1210 (KGQ32) |
|------------------------|--------------|--------------|--------------|--------------|
| Thickness Letter       | F            | A            | H            | D            |
| Max Thickness(mm)      | 0.60         | 0.90         | 1.15         | 1.40         |
| Carrier Tape           | PAPER        | PAPER        | PAPER        | PAPER        |
| Packaging Code 7"reel  | H            | T            | T            | T            |
| Packaging Code 13"reel | N            | M            | M            | M            |
| PAPER                  |              |              |              |              |

| Capacitance Range | Available Tolerances |
|-------------------|----------------------|
| 0.20-0.50 pF      | B, C                 |
| 0.60-6.2 pF       | B,C, D               |
| 6.8- 9.1 pF       | B, C, J, K, M        |
| 10-1000 pF        | F,G, J, K, M         |

# RF/Microwave Capacitors

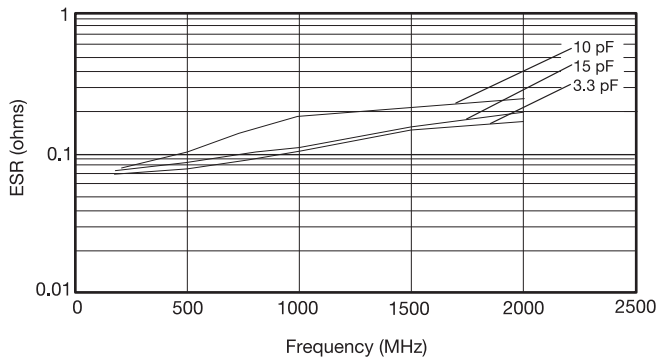
## RF/Microwave C0G (NP0) Capacitors

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

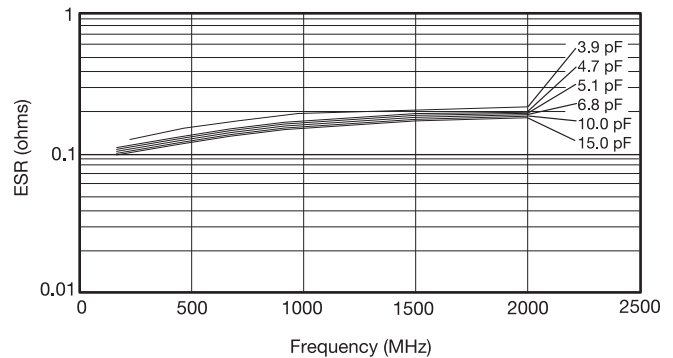


#### ULTRA LOW ESR, "U" SERIES

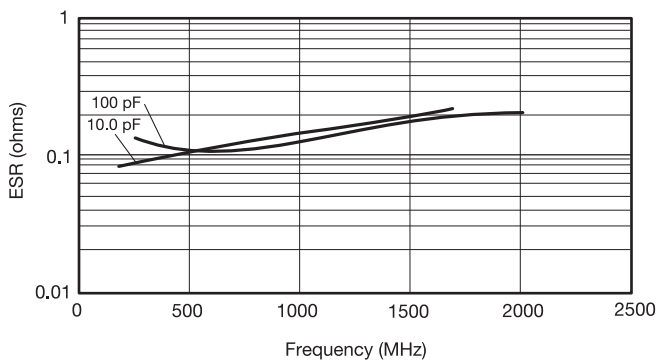
TYPICAL ESR vs. FREQUENCY  
0402 "U" SERIES



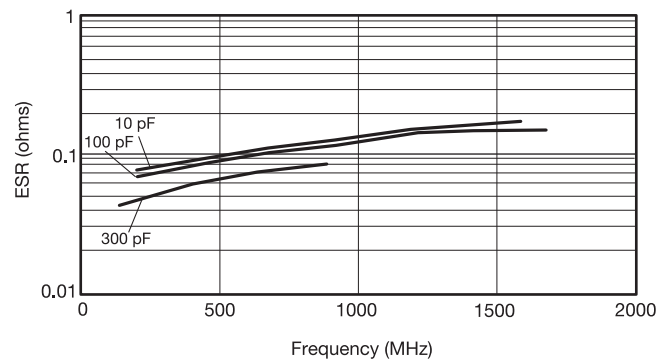
TYPICAL ESR vs. FREQUENCY  
0603 "U" SERIES



TYPICAL ESR vs. FREQUENCY  
0805 "U" SERIES

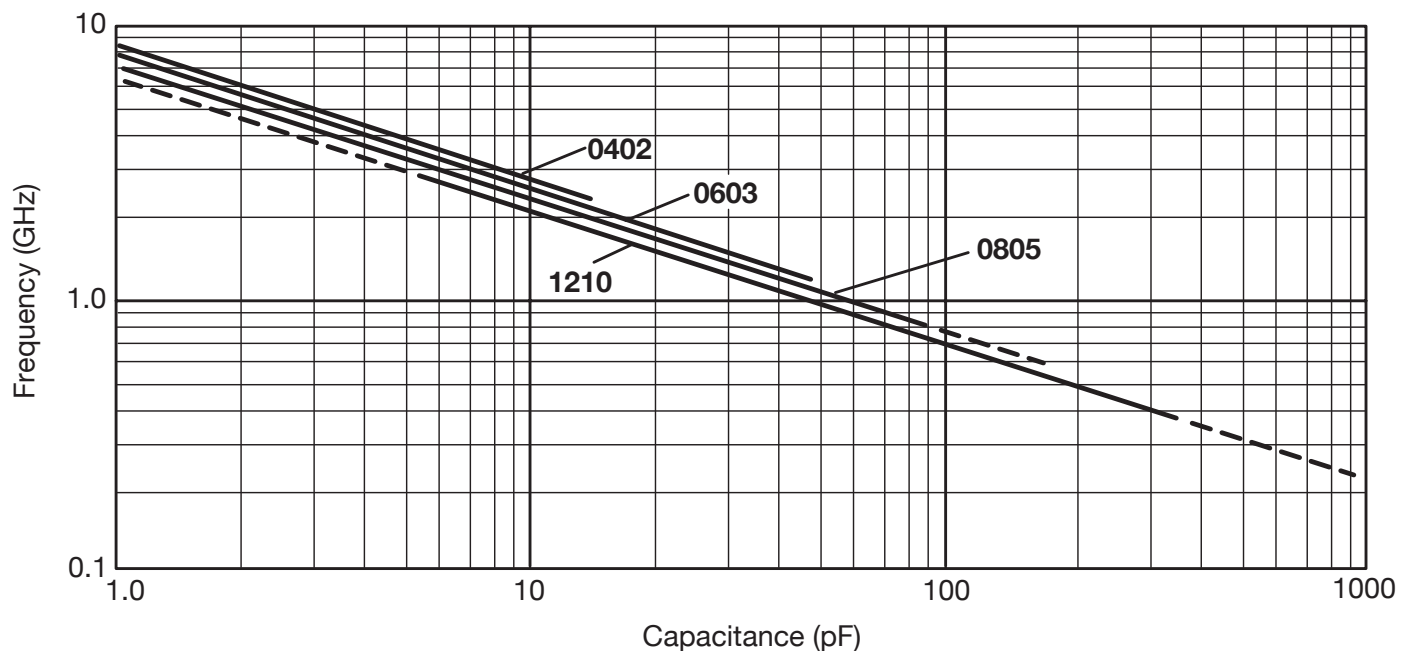


TYPICAL ESR vs. FREQUENCY  
1210 "U" SERIES



ESR Measured on the Boonton 34A

#### TYPICAL SERIES RESONANT FREQUENCY "U" SERIES CHIP



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