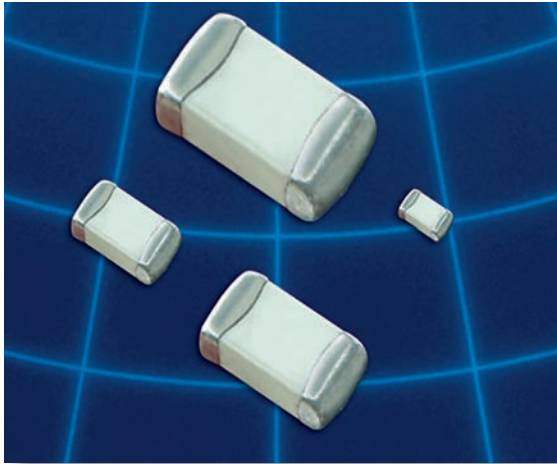


# MULTI-LAYER HIGH-Q CAPACITORS



These lines of multilayer capacitors have been developed for High-Q and microwave applications.

- The **S-Series** (R07S, R14S, R15S) capacitors give an ultra-high Q performance, and exhibit NP0 temperature characteristics.
- The **L-Series** (R05L) capacitors give mid-high Q performance, and exhibit NP0 temperature characteristics.
- The **E-Series** (S42E, S48E, S58E) capacitors give excellent high-Q performance from HF to Microwave frequencies. Typical uses are high voltage, high current applications. They are offered in chip (Ni barrier or Non-Magnetic Pt.-Ag) or in Non-Magnetic leaded form.
- RoHS compliance is standard for all unleaded parts (see termination options box).

## HOW TO ORDER

|                                                                                                                                                                    |                                                                                                                    |                                                                                                                                             |                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |          |          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------|
| <b>252</b>                                                                                                                                                         | <b>S48</b>                                                                                                         | <b>E</b>                                                                                                                                    | <b>470</b>                                                                                                                                                                                                          | <b>K</b>                                                                                                                                                                                                                                                                                                          | <b>V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>4</b> | <b>E</b> |
| <b>WVDC<sup>2</sup></b><br>250 = 25 V<br>201 = 200 V<br>251 = 250 V<br>501 = 500 V<br>102 = 1000 V<br>152 = 1500 V<br>252 = 2500 V<br>362 = 3600 V<br>722 = 7200 V | <b>CASE SIZE</b><br>R05 (0201)<br>R07 (0402)<br>R14 (0603)<br>R15 (0805)<br>S42 (1111)<br>S48 (2525)<br>S58 (3838) | <b>CAPACITANCE (pF)</b><br>1st two digits are significant; third digit denotes number of zeros, R = decimal.<br>100 = 10 pF<br>101 = 100 pF | <b>TOLERANCE</b><br>A = $\pm 0.05$ pF<br>B = $\pm 0.10$ pF<br>C = $\pm 0.25$ pF<br>D = $\pm 0.50$ pF<br>F = $\pm 1$ %<br>G = $\pm 2$ %<br>J = $\pm 5$ %<br>K = $\pm 10$ %<br>For tolerance availability, see chart. | <b>TERMINATION</b><br><b>Nickel Barrier</b><br>V = Ni/Sn (Green)<br>T = Ni/SnPb<br>G = Ni/Au (Green)<br><b>Non-Mag<sup>1</sup></b><br>U = Cu/Sn (Green)<br>C = Cu/SnPb<br><b>Leaded (All Non-Mag)<sup>1</sup></b><br>1 = Microstrip<br>2 = Axial Ribbon<br>3 = Axial Wire<br>4 = Radial Ribbon<br>5 = Radial Wire | <b>PACKAGING</b><br>S = Bulk<br>W = Waffle Pack<br><b>0201 - 0603</b><br>Y = Paper 5" Reel<br>T = Paper 7" Reel<br>R <sup>1</sup> = Paper 13" Reel<br>J <sup>1</sup> = Paper 5" Reel - Horizontally Oriented Electrodes<br>N <sup>1</sup> = Paper 5" Reel - Vertically Oriented Electrodes<br>L <sup>1</sup> = Paper 7" Reel - Horizontally Oriented Electrodes<br>V <sup>1</sup> = Paper 7" Reel - Vertically Oriented Electrodes<br><b>0805 - 3838</b><br>Z = Embossed 5" Reel<br>E = Embossed 7" Reel<br>U <sup>1</sup> = Embossed 13" Reel<br>M <sup>1</sup> = Embossed 5" Reel - Horizontally Oriented Electrodes<br>Q <sup>1</sup> = Embossed 5" Reel - Vertically Oriented Electrodes<br>G <sup>1</sup> = Embossed 7" Reel - Horizontally Oriented Electrodes<br>P <sup>1</sup> = Embossed 7" Reel - Vertically Oriented Electrodes<br>Tape specifications conform to EIA RS481 |          |          |
| Part Number written: <b>252S48E470KV4E</b>                                                                                                                         |                                                                                                                    |                                                                                                                                             |                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |          |          |
| <b>MARKING</b><br>3 = Cap Code & Tolerance<br>4 = No Marking<br>6 = EIA Code<br>(Marking option is only available on 0805 and larger case sizes)                   |                                                                                                                    |                                                                                                                                             |                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |          |          |

<sup>1</sup> - Not available for all MLCC - Call factory for info.  
<sup>2</sup> - WVDC - Working Voltage DC.



## Low ESR / High-Q CAPACITOR SELECTION CHART

| Cap. Value     |      | EIA Size |  | RF Power Applications |            |        |        |        |        |        |        |        |       |
|----------------|------|----------|--|-----------------------|------------|--------|--------|--------|--------|--------|--------|--------|-------|
|                |      |          |  | 0201 (R05)            |            | 0402   | 0603   | 0805   | 0805   | 1111   | 2525   | 3838   |       |
|                |      |          |  | NPO (R05L)            | NPO (R05G) | (R07S) | (R14S) | (R15S) | (R15G) | (S42E) | (S48E) | (S58E) |       |
| Capacitance pF | Code |          |  |                       |            |        |        |        |        |        |        |        |       |
| 0.1            | 0R1  |          |  |                       |            |        |        |        |        |        |        |        |       |
| 0.2            | 0R2  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  |        |        | 500V   | 1500V  |        |       |
| 0.3            | 0R3  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  |        |       |
| 0.4            | 0R4  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  |        |       |
| 0.5            | 0R5  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  |       |
| 0.6            | 0R6  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 0.7            | 0R7  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 0.8            | 0R8  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 0.9            | 0R9  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 1.0            | 1R0  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 1.1            | 1R1  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 1.2            | 1R2  | A        |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 1.3            | 1R3  | B        |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 1.4            | 1R4  | C        |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 1.5            | 1R5  | D        |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 1.6            | 1R6  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 1.7            | 1R7  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 1.8            | 1R8  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 1.9            | 1R9  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 2.0            | 2R0  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 2.1            | 2R1  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 2.2            | 2R2  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 2.4            | 2R4  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 2.7            | 2R7  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 3.0            | 3R0  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 3.3            | 3R3  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 3.6            | 3R6  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 3.9            | 3R9  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 4.3            | 4R3  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 4.7            | 4R7  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 5.1            | 5R1  | A**      |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 5.6            | 5R6  | B        |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 6.2            | 6R2  | C        |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 6.8            | 6R8  | D        |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 7.5            | 7R5  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 8.2            | 8R2  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 9.1            | 9R1  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 10             | 100  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 11             | 110  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 12             | 120  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 13             | 130  | F        |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 15             | 150  | G        |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 16             | 160  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 18             | 180  |          |  | 25 V                  | 25 V       | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 20             | 200  | J        |  | 25 V                  |            | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 22             | 220  | K        |  | 25 V                  |            | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 24             | 240  |          |  | 25 V                  |            | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 27             | 270  |          |  | 25 V                  |            | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 30             | 300  |          |  | 25 V                  |            | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |
| 33             | 330  |          |  | 25 V                  |            | 200 V  | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V |

Consult factory for Non-Standard values.

\*\*A tolerance only available for R07S (0402) and R14S(0603) caps

## Low ESR / HIGH-Q CAPACITOR SELECTION CHART

| EIA Size<br>Cap. Value |      |                  | RF Power Applications |               |        |        |        |        |        |        |        |             |
|------------------------|------|------------------|-----------------------|---------------|--------|--------|--------|--------|--------|--------|--------|-------------|
|                        |      |                  | 0201 (R05)            |               | 0402   | 0603   | 0805   | 0805   | 1111   | 2525   | 3838   |             |
|                        |      |                  | NPO<br>(R05L)         | NPO<br>(R05G) | (R07S) | (R14S) | (R15S) | (R15G) | (S42E) | (S48E) | (S58E) |             |
| Capacitance<br>pF      | Code | Toler-<br>ance   |                       |               |        |        |        |        |        |        |        |             |
| 36                     | 360  | F<br>G<br>J<br>K | 25 V                  |               |        | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V 7200V |
| 39                     | 390  |                  | 25 V                  |               |        | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V 7200V |
| 43                     | 430  |                  | 25 V                  |               |        | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V 7200V |
| 47                     | 470  |                  | 25 V                  |               |        | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V 7200V |
| 51                     | 510  |                  | 25 V                  |               |        | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V 7200V |
| 56                     | 560  |                  | 25 V                  |               |        | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V 7200V |
| 62                     | 620  |                  | 25 V                  |               |        | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V 7200V |
| 68                     | 680  |                  | 25 V                  |               |        | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V 7200V |
| 75                     | 750  |                  | 25 V                  |               |        | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V 7200V |
| 82                     | 820  |                  | 25 V                  |               |        | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V 7200V |
| 91                     | 910  |                  | 25 V                  |               |        | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V 7200V |
| 100                    | 101  |                  | 25 V                  |               |        | 250 V  | 250 V  | 1000V  | 500V   | 1500V  | 2500V  | 3600V 7200V |
| 110                    | 111  |                  |                       |               |        |        | 250 V  |        | 300V   | 1500V  | 2500V  | 3600V 7200V |
| 120                    | 121  |                  |                       |               |        |        | 250 V  |        | 300V   | 1000V  | 2500V  | 3600V 7200V |
| 130                    | 131  |                  |                       |               |        |        | 250 V  |        | 300V   | 1000V  | 2500V  | 3600V 7200V |
| 150                    | 151  |                  |                       |               |        |        | 250 V  |        | 300V   | 1000V  | 2500V  | 3600V 7200V |
| 160                    | 161  |                  |                       |               |        |        | 250 V  |        | 300V   | 1000V  | 2500V  | 3600V 7200V |
| 180                    | 181  |                  |                       |               |        |        | 250 V  |        | 300V   | 1000V  | 2500V  | 3600V 7200V |
| 200                    | 201  |                  |                       |               |        |        | 250 V  |        | 300V   | 1000V  | 2500V  | 3600V       |
| 220                    | 221  |                  |                       |               |        |        | 250 V  |        | 200V   | 1000V  | 2500V  | 3600V       |
| 240                    | 241  |                  |                       |               |        |        |        |        | 200V   | 1000V  | 2500V  | 3600V       |
| 270                    | 271  |                  |                       |               |        |        |        |        | 200V   | 1000V  | 2500V  | 3600V       |
| 300                    | 301  | G<br>J<br>K      |                       |               |        |        |        |        | 200V   | 1000V  | 1500V  | 3600V       |
| 330                    | 331  |                  |                       |               |        |        |        |        | 200V   | 1000V  | 1500V  | 3600V       |
| 360                    | 361  |                  |                       |               |        |        |        |        | 200V   | 1000V  | 1500V  | 3600V       |
| 390                    | 391  |                  |                       |               |        |        |        |        | 200V   | 500V   | 1500V  | 3600V       |
| 430                    | 431  |                  |                       |               |        |        |        |        | 200V   | 500V   | 1500V  | 2500V       |
| 470                    | 471  |                  |                       |               |        |        |        |        | 200V   | 500V   | 1500V  | 2500V       |
| 510                    | 511  |                  |                       |               |        |        |        |        | 100V   | 500V   | 1000V  | 2500V       |
| 560                    | 561  |                  |                       |               |        |        |        |        | 100V   | 500V   | 1000V  | 2500V       |
| 620                    | 621  |                  |                       |               |        |        |        |        | 100V   | 500V   | 1000V  | 2500V       |
| 680                    | 681  |                  |                       |               |        |        |        |        | 50V    |        | 1000V  | 2500V       |
| 750                    | 751  |                  |                       |               |        |        |        |        | 50V    |        | 1000V  | 2500V       |
| 820                    | 821  |                  |                       |               |        |        |        |        | 50V    |        | 1000V  | 2500V       |
| 910                    | 911  |                  |                       |               |        |        |        |        | 50V    |        | 1000V  | 1000V       |
| 1000                   | 102  |                  |                       |               |        |        |        |        | 50V    |        | 1000V  | 1000V       |
| 1200                   | 122  |                  |                       |               |        |        |        |        |        |        | 1000V  | 1000V       |
| 1500                   | 152  |                  |                       |               |        |        |        |        |        |        | 500V   | 1000V       |
| 1800                   | 182  |                  |                       |               |        |        |        |        |        |        | 500V   | 1000V       |
| 2200                   | 222  |                  |                       |               |        |        |        |        |        |        | 300V   | 1000V       |
| 2700                   | 272  |                  |                       |               |        |        |        |        |        |        | 300V   | 500V        |
| 3300                   | 332  |                  |                       |               |        |        |        |        |        |        |        | 500V        |
| 3900                   | 392  |                  |                       |               |        |        |        |        |        |        |        | 500V        |
| 4700                   | 472  |                  |                       |               |        |        |        |        |        |        |        | 500V        |
| 5100                   | 512  |                  |                       |               |        |        |        |        |        |        |        | 500V        |
| 10000                  | 103  |                  |                       |               |        |        |        |        |        |        |        |             |

Consult factory for Non-Standard values.



## DIELECTRIC CHARACTERISTICS

## NPO

|                          |                                                                                                                                                                         |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TEMPERATURE COEFFICIENT: | 0 ± 30ppm /°C, -55 to 125°C                                                                                                                                             |
| QUALITY FACTOR / DF:     | Q >1,000 @ 1KHz (C>1,000pF), Typical 10,000 (C<1,000 pF)                                                                                                                |
| INSULATION RESISTANCE:   | >100 GΩ @ 25°C, WVDC <sup>1</sup> ;<br>125°C IR is 10% of 25°C rating                                                                                                   |
| DIELECTRIC STRENGTH:     | 500 V ≤ 2.5 X WVDC <sup>1</sup> Min., 25°C, 50 mA max<br>1000 V ≤ 1.5 X WVDC <sup>1</sup> Min., 25°C, 50 mA max<br>> 1500 = 1 X WVDC <sup>1</sup> Min., 25°C, 50 mA max |
| TEST PARAMETERS::        | 1MHz ±50kHz, 1.0±0.2 VRMS, 25°C                                                                                                                                         |
| AVAILABLE CAPACITANCE:   |                                                                                                                                                                         |
| Size 0201:               | 0.2 - 100 pF                                                                                                                                                            |
| Size 0402:               | 0.2 - 33 pF                                                                                                                                                             |
| Size 0603:               | 0.2 - 100 pF                                                                                                                                                            |
| Size 0805:               | 0.3 - 220 pF                                                                                                                                                            |
| Size 1111:               | 0.2 - 1000 pF                                                                                                                                                           |
| Size 2525:               | 1.0 - 2700 pF                                                                                                                                                           |
| Size 3838:               | 1.0 - 5100 pF                                                                                                                                                           |

## MECHANICAL & ENVIRONMENTAL CHARACTERISTICS

|                               | SPECIFICATION                                                                                                                                                 | TEST PARAMETERS                                                                                                                                                                                                             |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SOLDERABILITY:                | Solder coverage ≥ 90% of metalized areas<br>No termination degradation                                                                                        | Preheat chip to 120°-150°C for 60 sec., dip terminals in rosin flux then dip in Sn62 solder @ 240°±5°C for 5±1 sec                                                                                                          |
| RESISTANCE TO SOLDERING HEAT: | No mechanical damage<br>Capacitance change: ±2.5% or 0.25pF<br>Q>500 I.R. >10 G Ohms<br>DWV <sup>2</sup> : 2.5 x WVDC <sup>1</sup>                            | Preheat device to 80°-100°C for 60 sec.<br>followed by 150°-180°C for 60 sec.<br>Dip in 260°±5°C solder for 10±1 sec.<br>Measure after 24±2 hour cooling period                                                             |
| TERMINAL ADHESION:            | Termination should not pull off.<br>Ceramic should remain undamaged.                                                                                          | Linear pull force <sup>3</sup> exerted on axial leads soldered to each terminal.                                                                                                                                            |
| PCB DEFLECTION:               | No mechanical damage.<br>Capacitance change: 2% or 0.5pF Max                                                                                                  | Glass epoxy PCB: 0.5 mm deflection                                                                                                                                                                                          |
| LIFE TEST:                    | MIL-STD-202, Method 108I<br>No mechanical damage<br>Capacitance change: ±3.0% or 0.3 pF<br>Q>500 I.R. >1 G Ohms<br>DWV <sup>2</sup> : 2.5 x WVDC <sup>1</sup> | Applied voltage: 200% of WVDC <sup>1</sup> for capacitors rated at 500 volts DC or less.<br>100% of WVDC <sup>1</sup> for capacitors rated at 1250 volts DC or less.<br>Temperature: 125°±3°C<br>Test time: 1000+48-0 hours |
| THERMAL CYCLE:                | No mechanical damage.<br>Capacitance change: ±2.5% or 0.25pF<br>Q>2000 I.R. >10 G Ohms<br>DWV <sup>2</sup> : 2.5 x WVDC <sup>1</sup>                          | 5 cycles of: 30±3 minutes @ -55°+0/-3°C,<br>2-3 min. @ 25°C, 30±3 min. @ +125°+3/-0°C,<br>2-3 min. @ 25°C<br>Measure after 24±2 hour cooling period                                                                         |
| HUMIDITY, STEADY STATE:       | No mechanical damage.<br>Capacitance change: ±5.0% or 0.50pF max.<br>Q>300 I.R. ≥ 1 G-Ohm<br>DWV <sup>2</sup> : 2.5 x WVDC <sup>1</sup>                       | Relative humidity: 90-95%<br>Temperature: 40°±2°C<br>Test time: 500 +12/-0 Hours<br>Measure after 24±2 hour cooling period                                                                                                  |
| HUMIDITY, LOW VOLTAGE:        | No mechanical damage.<br>Capacitance change: ±5.0% or 0.50pF max.<br>Q>300 I.R. = 1 G-Ohm min.<br>DWV <sup>2</sup> : 2.5 x WVDC <sup>1</sup>                  | Applied voltage: 1.5 VDC, 50 mA max.<br>Relative humidity: 85±2% Temperature: 40°±2°C<br>Test time: 240 +12/-0 Hours<br>Measure after 24±2 hour cooling period                                                              |
| VIBRATION:                    | No mechanical damage.<br>Capacitance change: ±2.5% or 0.25pF<br>Q>1000 I.R. ≥ 10 G-Ohm<br>DWV <sup>2</sup> : 2.5 x WVDC <sup>1</sup>                          | Cycle performed for 2 hours in each of three perpendicular directions<br>Frequency range 10Hz to 55 Hz to 10 Hz traversed in 1 minute. Harmonic motion amplitude: 1.5mm                                                     |

<sup>1</sup> - WVDC - Working Voltage DC.

<sup>2</sup> - DWV - Dielectric Withstanding Voltage.

<sup>3</sup> - 0402 ≥ 2.0lbs, 0603 ≥ 4.0lbs (min).

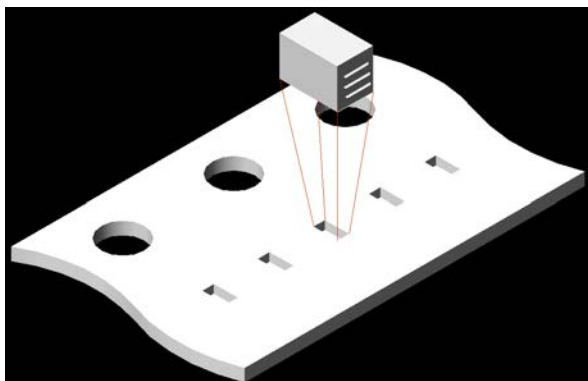
<sup>4</sup> - Whichever is less.

## MECHANICAL CHARACTERISTICS

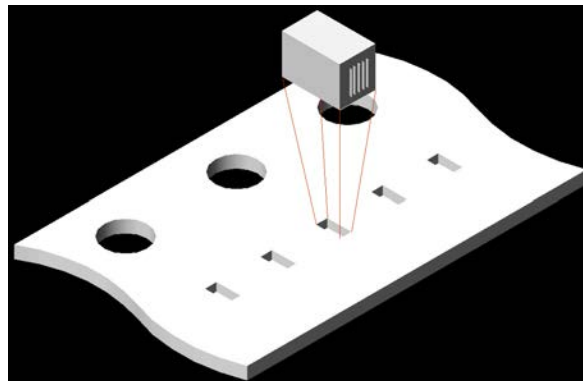
| Size          | Units | Length       | Width        | Thickness        | End Band    |
|---------------|-------|--------------|--------------|------------------|-------------|
| EIA 0201      | In    | .024 ±.001   | .012 ±.001   | .012 ±.001       | .008 Max.   |
| Metric (0603) | mm    | (0.60 ±0.03) | (0.30 ±0.03) | (0.30 ±0.03)     | (0.20 Max.) |
| EIA 0402      | In    | .040 ±.004   | .020 ±.004   | .020 ±.004       | .010 ±.006  |
| Metric (1005) | mm    | (1.02 ±0.1)  | (0.51 ±0.1)  | (0.51 ±0.1)      | (0.25 ±.15) |
| EIA 0603      | In    | .062 ±.006   | .032 ±.006   | .030 +.005/-.003 | .014 ±.006  |
| Metric (1608) | mm    | (1.57 ±0.15) | (0.81 ±0.15) | (0.76 +.13-.08)  | (0.35 ±.15) |
| EIA 0805      | In    | .080 ±.008   | .050 ±.008   | .040 ±.006       | .020 ±.010  |
| Metric (2012) | mm    | (2.03 ±0.20) | (1.27 ±0.20) | (1.02 ±.15)      | (0.50 ±.25) |

## HORIZONTAL AND VERTICAL ORIENTED CAPACITORS

### Horizontal Electrode Orientation



### Vertical Electrode Orientation



## APPLICATIONS & FEATURES

Size: EIA 0201, 0402  
Performance: SRF's up to 20 GHz, Ultra High Q, Tight tolerance, Ultralow ESR  
Termination: Ni/Au, Ni/Sn, Ni/SnPb  
Applications: High Frequency Wireless Communications, Portable Wireless Products, Battery Powered Products  
RoHS Compliant

## BENEFITS OF USING ORIENTED CAPACITORS

- Consistent Orientation - Improved repeatability of production circuits.
- Consistent Orientation - More consistent filter performance.
- Vertical Orientation - The elimination of parallel frequencies.
- Vertical Orientation - Lower inductance for a given capacitor.
- Horizontal Orientation - Lower coupling between adjacent capacitors.



## E-SERIES TERMINATIONS AND LEADS

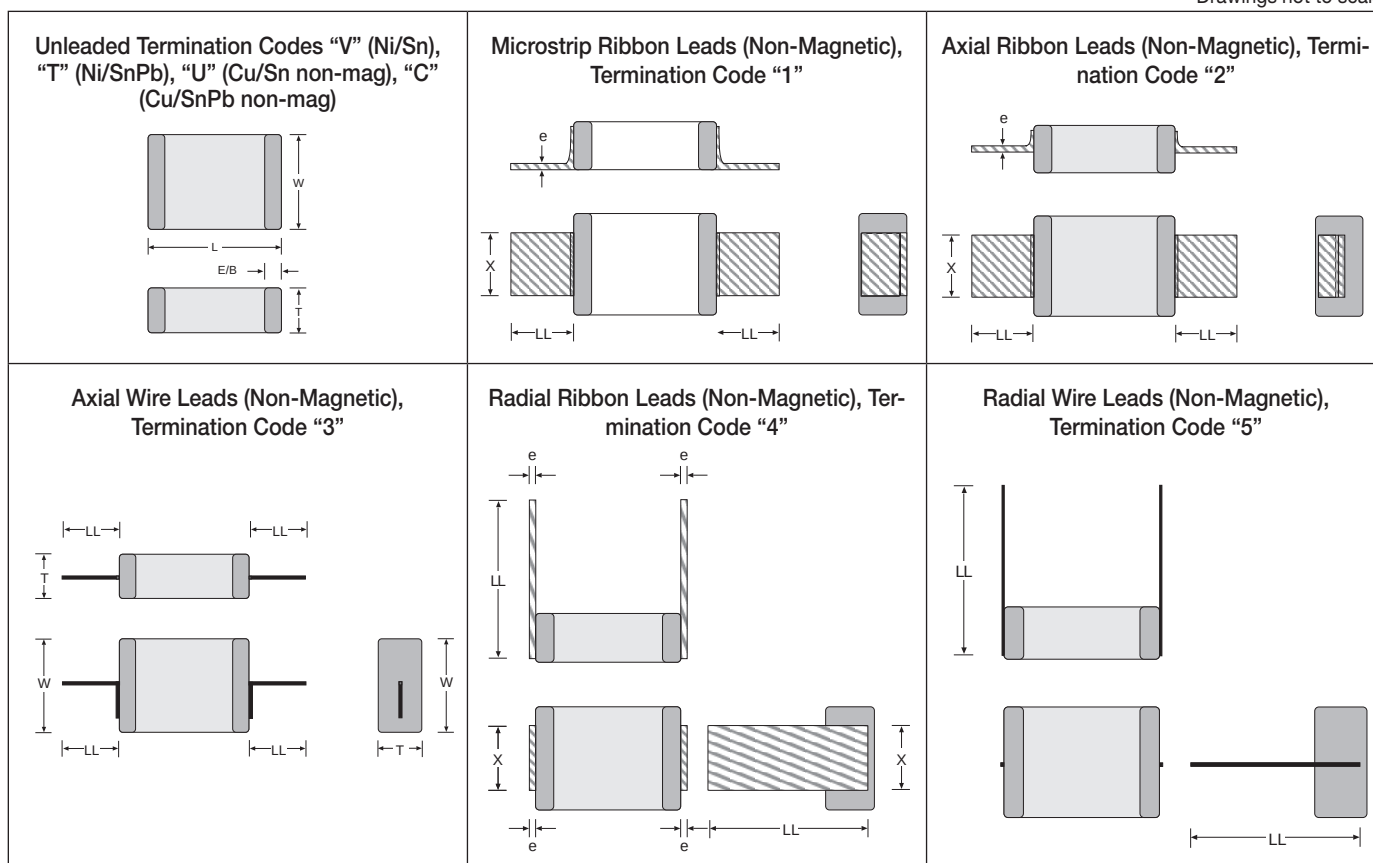
### CHIP DIMENSIONS

| Termination  | Size | Units | L     | Tol           | W     | Tol      | T          | E / B      | Tol       |
|--------------|------|-------|-------|---------------|-------|----------|------------|------------|-----------|
| V, T<br>U, C | S42E | In    | 0.110 | +0.020 -0.010 | 0.110 | +/- .015 | 0.102 Max. | 0.015 Typ. | +/- 0.008 |
|              |      | mm    | 2.79  | +0.51 -0.25   | 2.79  | +/- 0.38 | 2.59 Max.  | 0.38 Typ.  | +/- 0.20  |
|              | S48E | In    | 0.230 | +0.025 -0.010 | 0.250 | +/- .015 | 0.150 Max. | 0.025 Typ. |           |
|              |      | mm    | 5.84  | +0.63 -0.25   | 6.35  | +/- 0.38 | 3.81 Max.  | 0.63 Typ.  |           |
|              | S58E | In    | 0.380 | +0.015 -0.010 | 0.380 | +/- .010 | 0.170 Max. | 0.025 Typ. |           |
|              |      | mm    | 9.65  | +0.38 -0.25   | 9.65  | +/- 0.25 | 4.32 Max.  | 0.63 Typ.  |           |

For all E-Series Models:

**OPERATING TEMP. :** -55 to +125°C  
**INSULATION RESISTANCE:** >10G  $\Omega$  @ 25°C  
**TEMPERATURE COEFFICIENT:**  $0 \pm 30\text{ppm}/^\circ\text{C}$ , -55 to 125°C  
**DISSIPATION FACTOR (TYP):** < 0.05% @ 1 MHz

Drawings not to scale

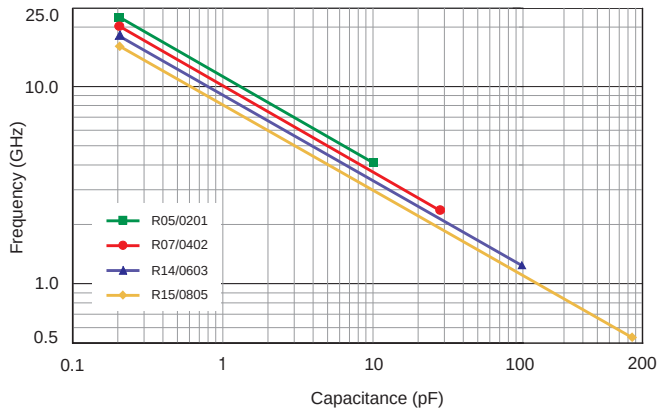


| Lead | Size | LL(min) | X                             | Tol      | e     | e-Tol             |
|------|------|---------|-------------------------------|----------|-------|-------------------|
| 1    | S42E | 0.25    | 0.093                         | +/-0.005 | 0.004 | +/- 0.002         |
|      |      | 6.40    | 2.36                          | +/- 0.13 | 0.102 | +/- 0.051         |
|      | S48E | 0.394   | 0.217                         | +/- 0.02 | 0.009 | - 0.0019/+ 0.0031 |
|      |      | 10.0    | 5.5                           | +/- 0.50 | 0.220 | - 0.050/+ 0.080   |
|      | S58E | 0.748   | 0.35                          | +/- 0.02 | 0.010 | - 0.0019/+ 0.0039 |
|      |      | 19.00   | 8.90                          | +/- 0.50 | 0.250 | - 0.050/+ 0.100   |
| 2    | S42E | 0.25    | 0.093                         | +/-0.005 | 0.004 | +/- 0.002         |
|      |      | 6.40    | 2.36                          | +/- 0.13 | 0.102 | +/- 0.051         |
|      | S48E | 0.394   | 0.217                         | +/- 0.02 | 0.009 | - 0.0019/+ 0.0031 |
|      |      | 10.00   | 5.50                          | +/- 0.50 | 0.220 | - 0.050/+ 0.080   |
|      | S58E | 0.748   | 0.35                          | +/- 0.02 | 0.010 | - 0.0019/+ 0.0039 |
|      |      | 19.00   | 8.90                          | +/- 0.50 | 0.25  | - 0.050/+ 0.100   |
| 3    | S42E | 0.25    | 0.020in (0.511) diameter wire |          |       |                   |
|      |      | 6.40    |                               |          |       |                   |
|      | S48E | 0.394   |                               |          |       |                   |
|      |      | 10.00   |                               |          |       |                   |
|      | S58E | 0.748   |                               |          |       |                   |
|      |      | 19.00   |                               |          |       |                   |

| Lead | Size | LL(min) | X                             | Tol      | e     | e-Tol             |
|------|------|---------|-------------------------------|----------|-------|-------------------|
| 4    | S42E | 0.352   | 0.093                         | +/-0.005 | 0.004 | +/- 0.002         |
|      |      | 8.90    | 2.36                          | +/- 0.13 | 0.102 | +/- 0.051         |
|      | S48E | 0.501   | 0.217                         | +/- 0.02 | 0.009 | - 0.0019/+ 0.0031 |
|      |      | 12.70   | 5.50                          | +/- 0.50 | 0.220 | - 0.050/+ 0.080   |
|      | S58E | 0.886   | 0.35                          | +/- 0.02 | 0.010 | - 0.0019/+ 0.0039 |
|      |      | 22.50   | 8.90                          | +/- 0.50 | 0.25  | - 0.050/+ 0.100   |
| 5    | S42E | 0.25    | 0.020in (0.511) diameter wire |          |       |                   |
|      |      | 6.40    |                               |          |       |                   |
|      | S48E | 0.394   |                               |          |       |                   |
|      |      | 10.00   |                               |          |       |                   |
|      | S58E | 0.748   |                               |          |       |                   |
|      |      | 19.00   |                               |          |       |                   |

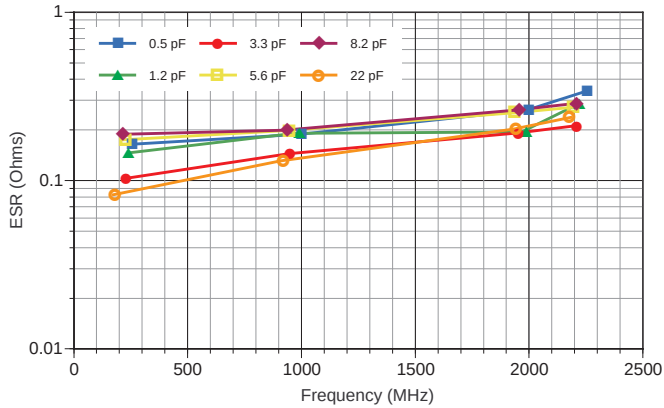
## SERIES RESONANCE CHART

Typical Series Resonant Frequency (Series Mounted)

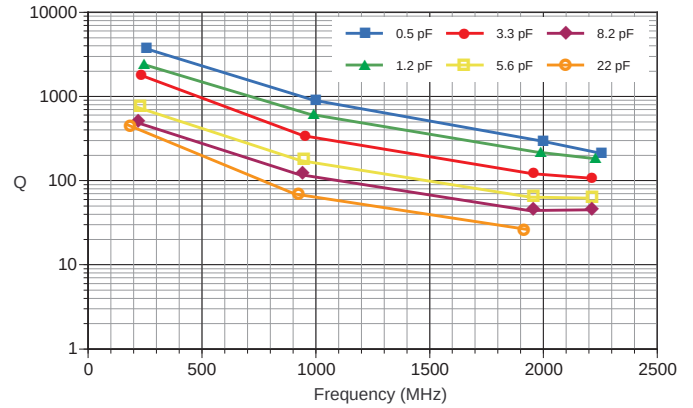


## RF CHARACTERISTICS - L-SERIES

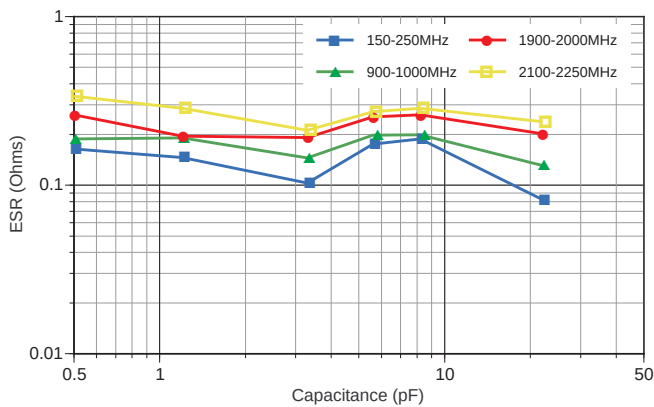
ESR vs Frequency: 0201/R05L



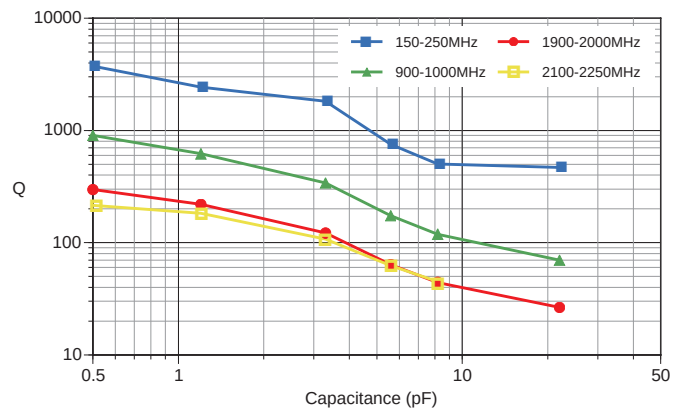
Q vs Frequency: 0201/R05L



ESR vs Capacitance: 0201/R05L

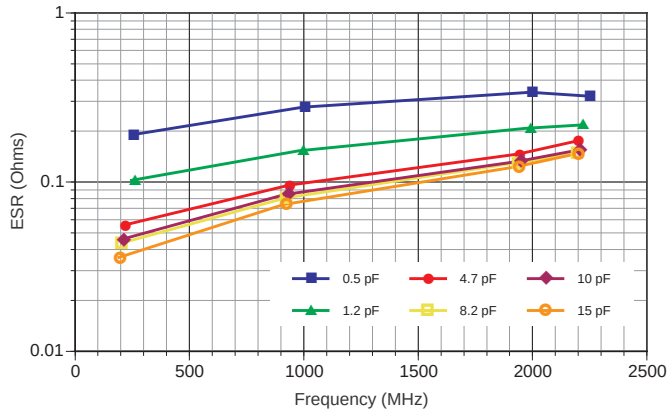


Q vs Capacitance: 0201/R05L

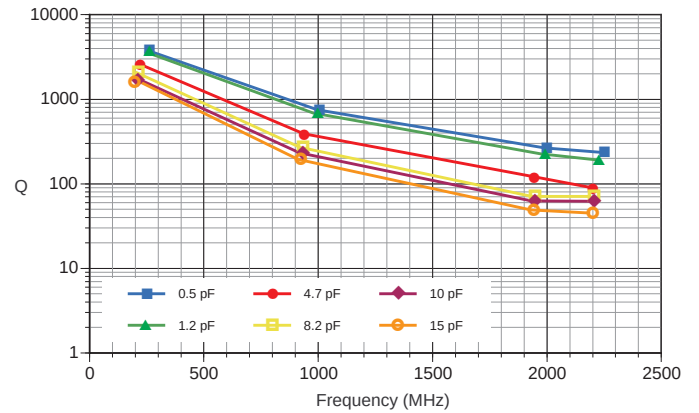


## S-SERIES RF CHARACTERISTICS VERSUS FREQUENCY

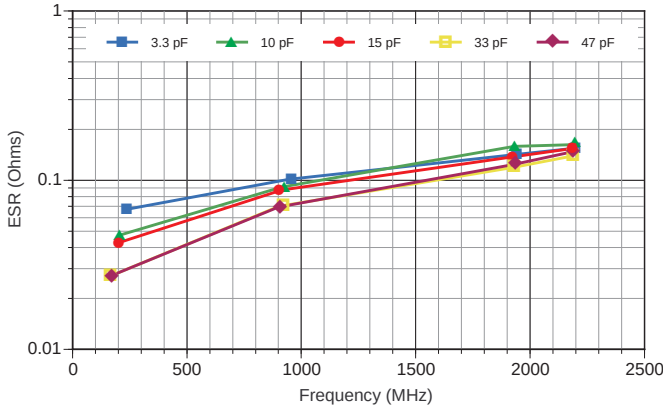
Equivalent Series Resistance: 0402/R07S



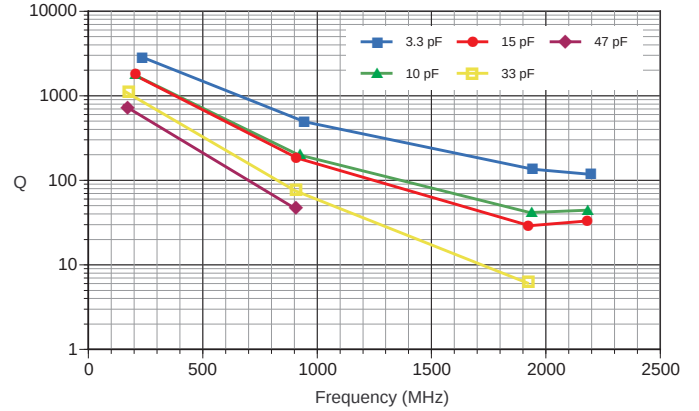
Q Factor: 0402/R07S



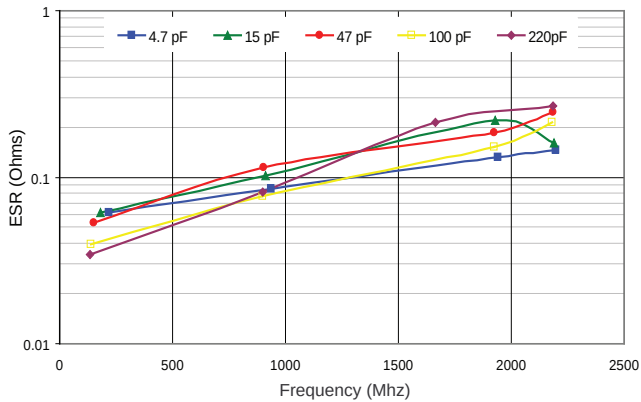
Equivalent Series Resistance: 0603/R14S



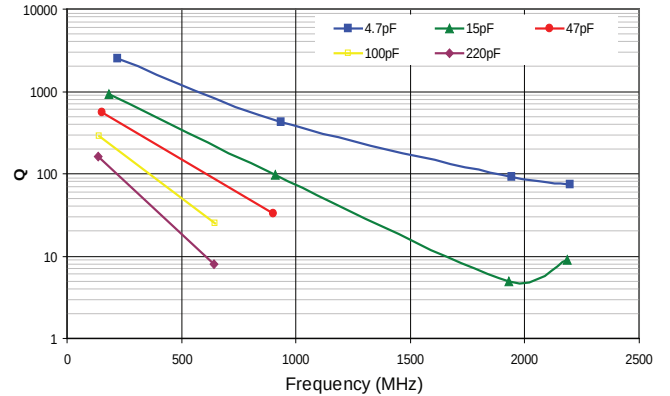
Q Factor: 0603/R14S



Equivalent Series Resistance: 0805/R15S



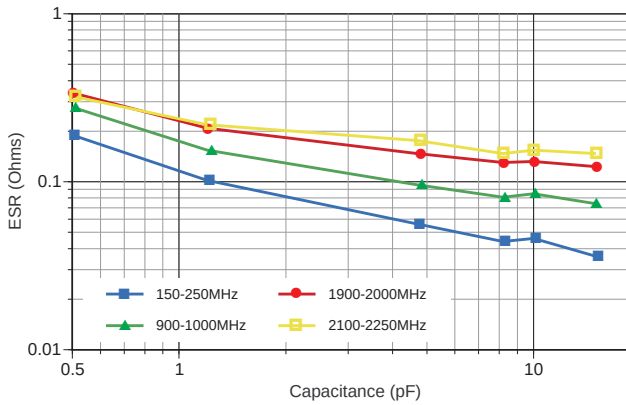
Q Factor: 0805/R15S



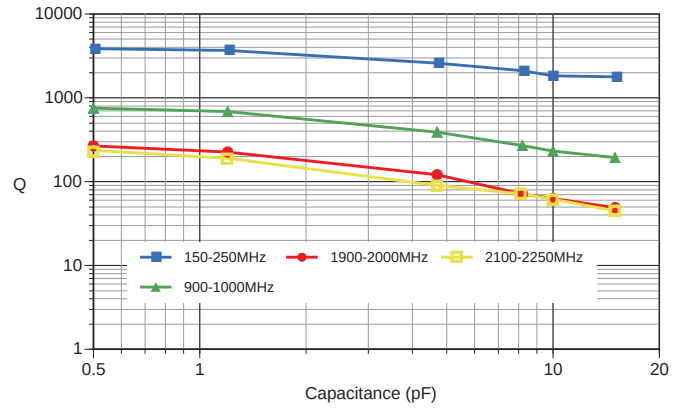
Measurements performed on a Boonton 34A Resonant Coaxial Line and represent typical capacitor performance.

## S-SERIES RF CHARACTERISTICS VERSUS CAPACITANCE

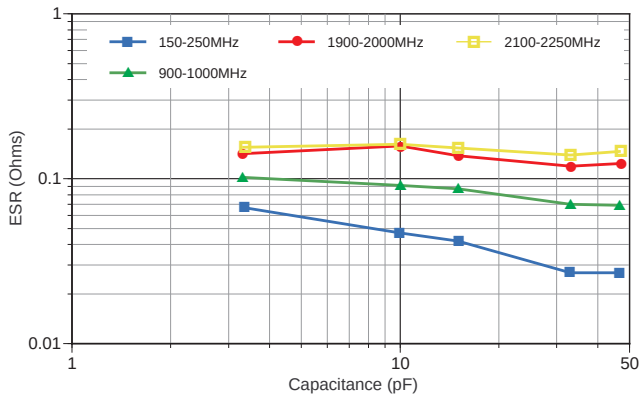
Equivalent Series Resistance: 0402/R07S



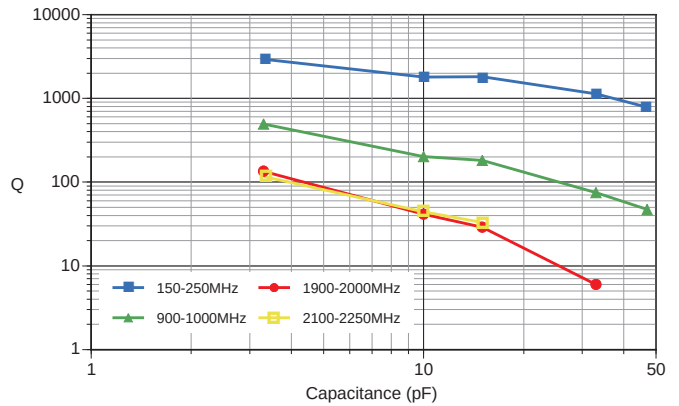
Q Factor: 0402/R07S



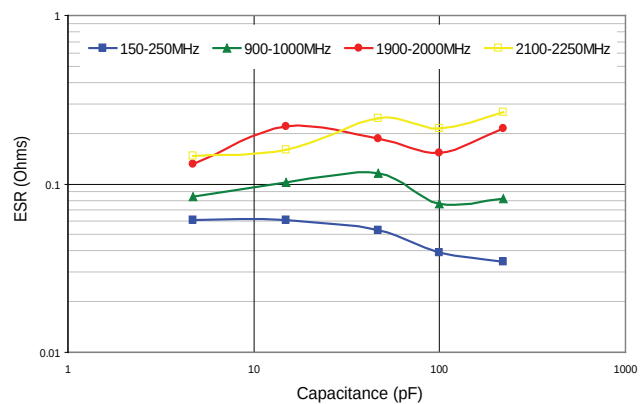
Equivalent Series Resistance: 0603/R14S



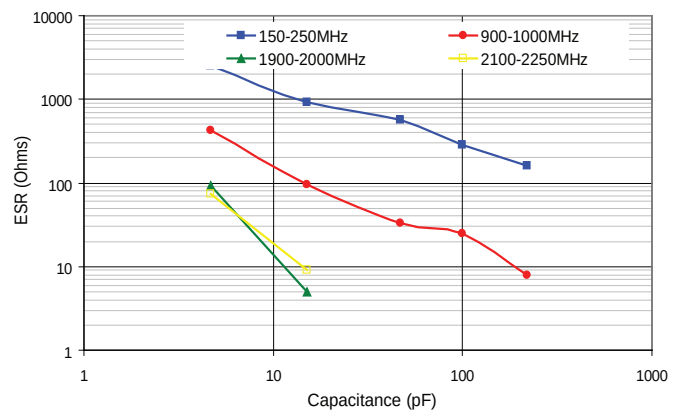
Q Factor: 0603/R14S



Equivalent Series Resistance: 0805/R15S



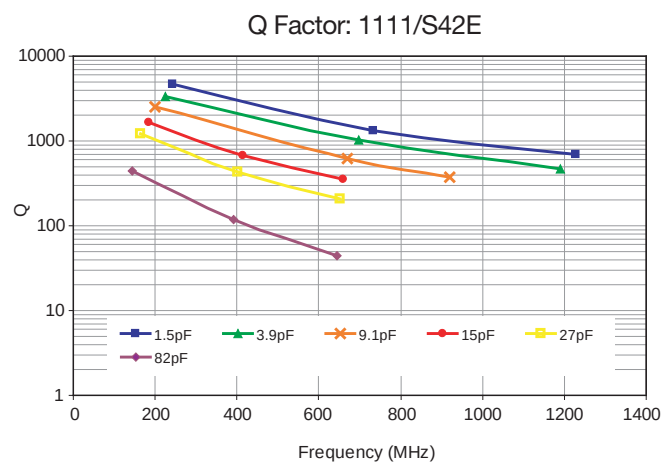
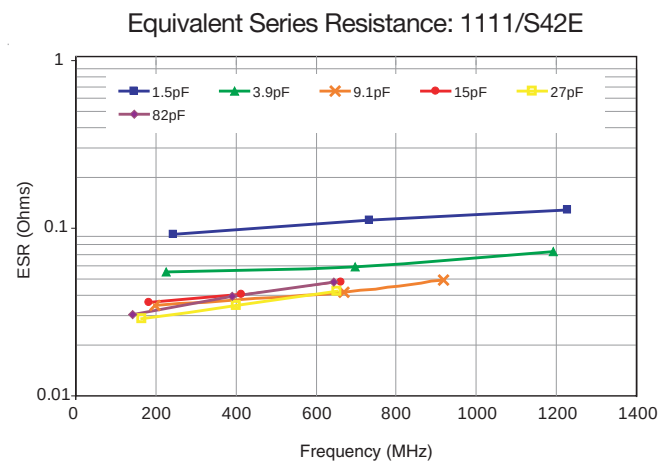
Q Factor: 0805/R15S



Measurements performed on a Boonton 34A Resonant Coaxial Line and represent typical capacitor performance.

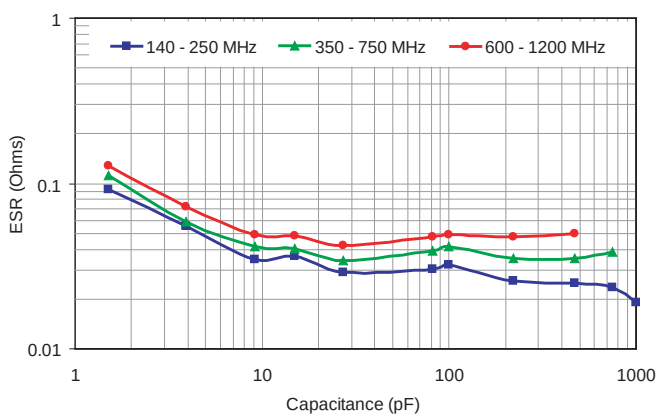


## S42E SERIES RF CHARACTERISTICS VERSUS FREQUENCY

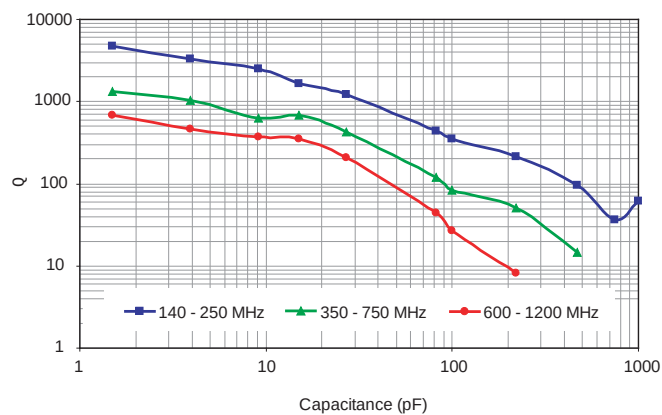


## S42E SERIES RF CHARACTERISTICS VERSUS CAPACITANCE

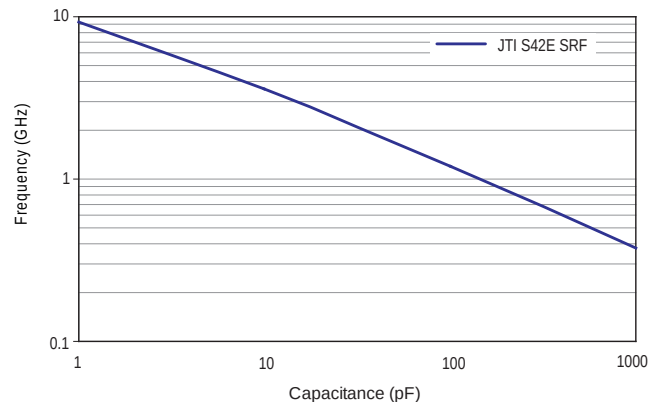
S42E Equivalent Series Resistance vs Capacitance, Typical



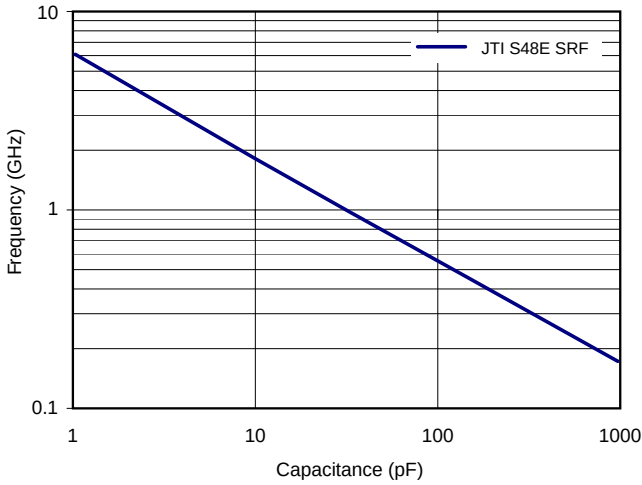
S42E Q vs. Capacitance, Typical



S42E SRF (Series Mount), Typical

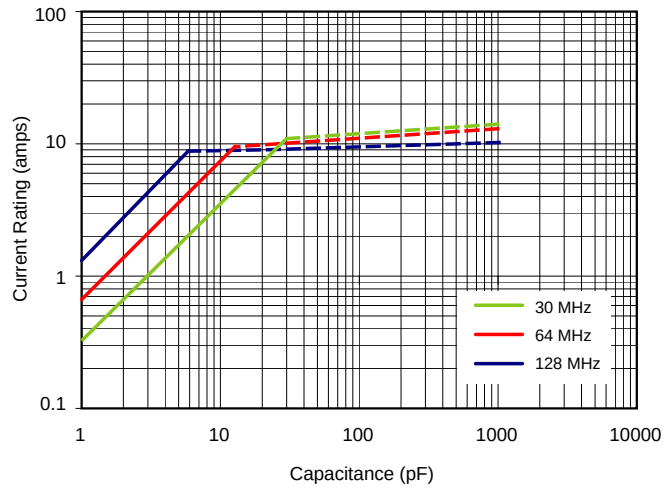


SRF (Shunt Mount), S48E, Typical (Preliminary)



As measured on a 8720C VNA, using a Shunt-Through fixture, and using the S11 magnitude dip to determine the SRF

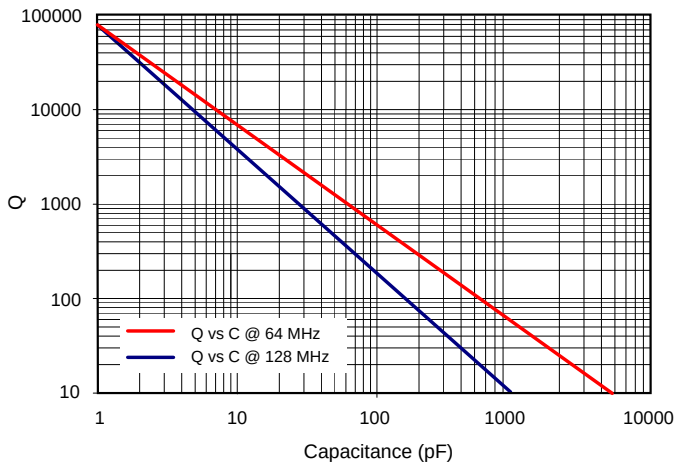
Current Rating vs. Capacitance, S48E, Typical (Preliminary)



Solid traces show voltage limited current (Vrms)

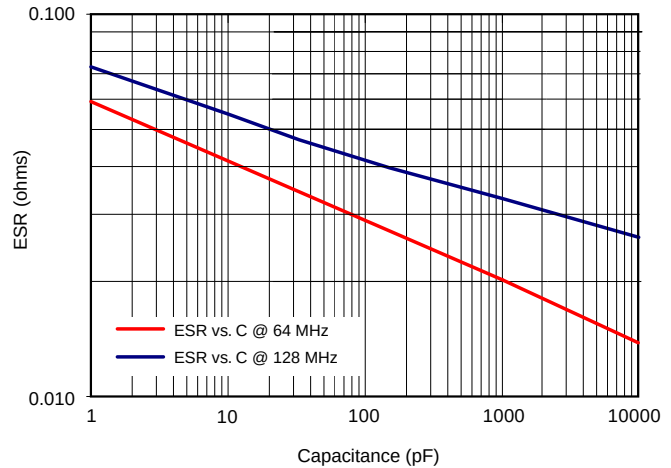
Dotted traces show power dissipation limited current (Based on 4 Watts Power Dissipation, and 125 degrees C case temp.)

S48E Q vs. Capacitance, Typical (Preliminary)



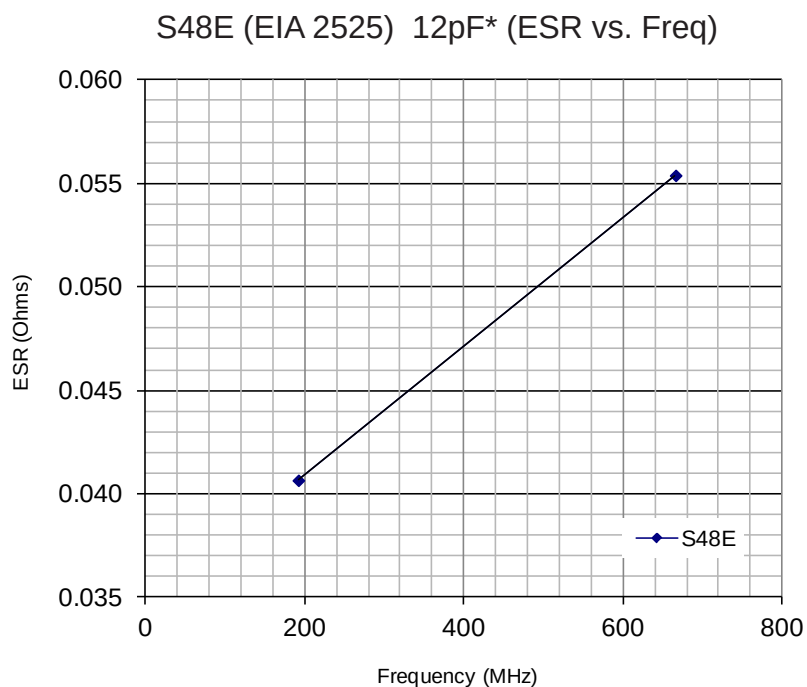
As measured on a 4287A LCR meter, using a 16092A fixture

S48E ESR vs. Capacitance, Typical (Preliminary)



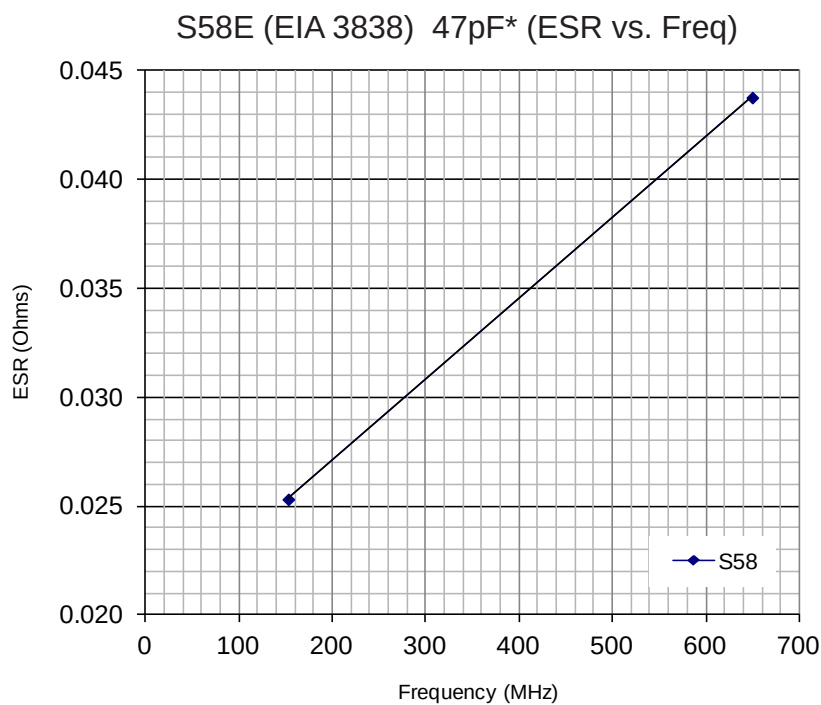
As measured on a 4287A LCR meter, using a 16092A fixture

## JTI S48E GRAPHICAL DATA



\*Actual data from Boonton 34A resonant line.

## JTI S58E GRAPHICAL DATA



\*Actual data from Boonton 34A resonant line.



# Mouser Electronics

Authorized Distributor

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## Johanson:

[250R05L1R8BV4T](#) [500R07S100FV4T](#) [500R07S2R0BV4T](#) [251R14S2R2BV4T](#) [251R14S0R6BV4T](#)  
[500R07S0R4AV4T](#) [500R07S0R3BV4T](#) [500R07S150FV4T](#) [251R14S1R8BV4T](#) [250R05L1R0BV4T](#)  
[251R14S1R2BV4T](#) [251R14S2R0BV4T](#) [251R14S1R0BV4T](#) [250R05L1R5BV4T](#) [500R07S1R2BV4T](#)  
[500R07S3R0BV4T](#) [500R07S4R7BV4T](#) [251R14S3R0BV4T](#) [500R07S100GV4T](#) [500R07S270JV4T](#) [500R07S0R9BV4T](#)  
[251R14S3R9BV4T](#) [500R07S2R2BV4T](#) [250R05L3R6CV4T](#) [500R07S5R6BV4T](#) [251R14S0R5BV4T](#)  
[500R07S2R7BV4T](#) [500R07S1R3BV4T](#) [500R07S100JV4T](#) [500R07S2R4BV4T](#) [251R14S120GV4T](#)  
[500R07S5R6CV4T](#) [500R07S1R2AV4T](#) [250R05L1R2BV4T](#) [500R07S1R5BV4T](#) [500R07S6R8CV4T](#)  
[251R14S330GV4T](#) [500R07S0R7BV4T](#) [500R07S0R4BV4T](#) [500R07S200GV4T](#) [500R07S1R0BV4T](#)  
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[251R14S6R8CV4T](#) [500R07S8R2CV4T](#) [500R07S0R5BV4T](#) [500R07S1R5AV4T](#) [251R14S3R3BV4T](#)  
[500R07S0R5AV4T](#) [102S42E1R3AV4E](#) [251R14S180JV4T](#) [250R05L5R1DV4T](#) [500R07S1R7BV4T](#) [501S42E2R4BV4E](#)  
[501S42E910KV4E](#) [301S42E111JV4E](#) [102S42E5R1CV4E](#) [251R15S2R0DV4E](#) [501S42E270FV4E](#)  
[251R15S820KV4E](#) [251R14S1R3CV4T](#) [251R14S470KV4T](#) [102S42E5R6CV4E](#) [501S42E910FV4E](#) [250R05L180JV4T](#)  
[251R15S131JV4E](#) [500S42E751JV4E](#) [201S42E241FV4E](#) [251R15S120GV4E](#) [250R05L5R6DV4T](#)  
[250R05L6R2CV4T](#) [251R14S510GV4T](#) [250R05L120JV4T](#) [251R15S221GV4E](#) [500R07S7R5BV4T](#) [102S42E4R3DV4E](#)  
[251R14S3R3DV4T](#) [501S42E240GV4E](#) [201R07S2R1DV4T](#) [251R15S101FV4E](#) [251R14S160KV4T](#)  
[500R07S8R2BV4T](#) [501S42E750GV4E](#) [102S42E1R2AV4E](#) [201R07S2R1AV4T](#) [250R05L4R3CV4T](#)  
[251R15S820FV4E](#) [250R05L160KV4T](#) [500R07S1R1AV4T](#) [251R14S470FV4T](#) [201S42E471KV4E](#)