Coilcraft S-Parameter Data for RF Surface Mount Inductors
Square Spring Air Core Inductors Series

Coilcraft, Inc.
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Coilcraft two-port S-parameter data files are based on empirical measurements of Coilcraft RF Surface Mount Inductors. The data files are used as "black box" descriptions to reduce complexity in circuit modeling. For one-port applications, simply connect one terminal of the component to ground in your circuit simulator software.

The models accurately simulate the frequency-dependent behavior of Coilcraft surface mount “Square Spring” air core inductors within the frequency limits shown in the accompanying table (Table 1, page 2) for each individual inductor. They are based on de-embedded measurements using a 2-port network analyzer.

Effects due to different circuit board traces, board materials, ground planes or interactions with other components are not included. They will have a significant effect when comparing the simulation to measurements of the individual inductors using other production verification instruments and fixtures.

Typically, the Self-Resonant Frequency (SRF) of the inductor model will be higher than a measurement of the component mounted on a circuit board. The parasitic reactive elements of a circuit board or fixture will effectively lower the circuit resonant frequency, especially for very small inductance values. Data sheet specifications are based on typical production measurements. These models are based on de-embedded 2-port measurements as described below, so the model results may be different from the data sheet specifications.

S-parameter modeling method

The measurements were made over a brass ground plane with each component centered over an air gap, as illustrated below. The TRL* calibration plane is also illustrated below. The gap width for each size component is given in Table 1. The test pads were 30 mil (50 Ohm) wide traces of tinned gold over 25 mil thick alumina, and were not included in the gap.

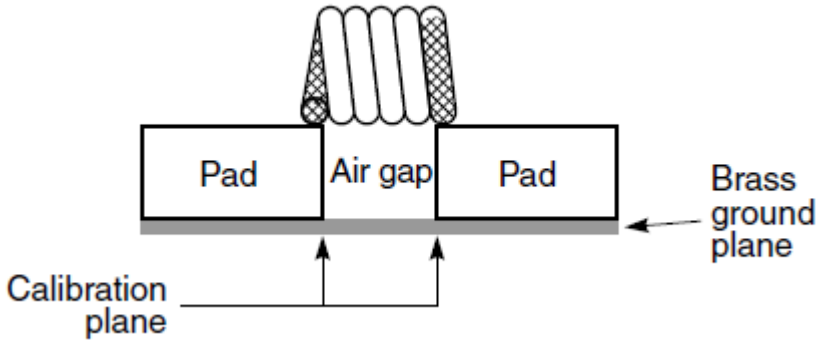

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Table 1. Gap Width

P/N	Gap (in.)	Gap (mm)
0806SQ-5N5	0.026	0.66
0806SQ-6N0	0.026	0.66
0806SQ-8N9	0.026	0.66
0806SQ-12N	0.04	1.016
0806SQ-16N	0.06	1.524
0806SQ-19N	0.06	1.524

P/N	Gap (in.)	Gap (mm)
0807SQ-6N9	0.026	0.66
0807SQ-10N	0.04	1.016
0807SQ-11N	0.04	1.016
0807SQ-14N	0.04	1.016
0807SQ-17N	0.06	1.524
0807SQ-22N	0.06	1.524

P/N	Gap (in.)	Gap (mm)
0908SQ-8N1	0.026	0.66
0908SQ-12N	0.04	1.016
0908SQ-14N	0.04	1.016
0908SQ-17N	0.06	1.524
0908SQ-22N	0.06	1.524
0908SQ-23N	0.06	1.524
0908SQ-25N	0.06	1.524
0908SQ-27N	0.06	1.524

The S-parameters were generated by matching our simulation model as closely as possible to an average of the original measurements. The model was then used to create the final S-parameters. This method results in a model that represents as closely as possible the typical frequency-dependent behavior of the component within the specified frequency limits of the model. Because our simulation models were used to generate our 2-port S-parameters, they give identical results with the same number of simulation frequency points. The simulation models are available on our web site at http://www.coilcraft.com/models.cfm.

The valid frequency range for each part is specified in Table 1 below.

Table 1
Valid Frequency Range of S-parameters

Part Number	Range (MHz)		Part Number	Range (MHz)
0806SQ-5N5	100 - 10000		0807SQ-17N	100 – 6000
0806SQ-6N0	100 - 10000		0807SQ-22N	100 – 5000
0806SQ-8N9	100 - 10000		0908SQ-8N1	100 – 7500
0806SQ-12N	100 - 7500		0908SQ-12N	100 – 7000
0806SQ-16N	100 - 6500		0908SQ-14N	100 – 6000
0806SQ-19N	100 – 5500		0908SQ-17N	100 – 5500
0807SQ-6N9	100 – 9000		0908SQ-22N	100 – 5000
0807SQ-10N	100 – 7500		0908SQ-23N	100 – 4400
0807SQ-11N	100 - 7000		0908SQ-25N	100 – 4000
0807SQ-14N	100 - 7000		0908SQ-27N	100 - 4000

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S-parameter file description.

All of the S-parameter data files are in the TouchStone format. The following is a typical data segment of a two-port file:

```
# MHZ  S  MA  R 50
!Freq    MagS11   AngS11   MagS21   AngS21   MagS12   AngS12   MagS22   AngS22
100      0.001    59.879   1.000    -0.036   1.000    -0.036   0.001    59.879
110      0.014    83.698   0.999    -0.798   0.999    -0.798   0.014    83.698
120      0.027    84.582   0.998    -1.558   0.998    -1.558   0.027    84.582
....
```

The first line (header) describes the frequency units, parameter, measurement format and characteristic impedance of the measurement (50 Ohms).
The first column is the frequency in MHz. The next columns are the S-parameters as described in the column headings.

Disclaimer

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