

Coilcraft S-Parameter Data for RF Surface Mount Inductors 0402DF Series Ferrite Chip Inductors

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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, thus reducing complexity in circuit modeling. For one-port applications, simply connect one terminal of the component to ground in your circuit simulator software.

The data files represent de-embedded measurements. Effects due to customer circuit board traces, board materials, ground planes, or interactions with other components are not included and can have a significant effect when comparing the S-parameters to measurements of the inductors using typical production verification instruments and fixtures.

Typically, the Self Resonant Frequency (SRF) of the component model will be higher than the 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.

S-parameter modeling method

The measurements for this series were made using a 50-Ohm impedance analyzer. Calibration was performed using open/short/load standards. Fixture compensation was performed using open and short standards.

The S-parameters were generated by matching a 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 model frequency range. The valid frequency range for each part is specified in Table 1 below.

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0402DF Series Ferrite Chip Inductors**

Table 1
Valid Frequency Range of S-parameters

Part Number	Range (MHz)		Part Number	Range (MHz)		Part Number	Range (MHz)
0402DF-200	1 – 3000		0402DF-181	1 – 3000		0402DF-591	1 – 3000
0402DF-360	1 – 3000		0402DF-221	1 – 3000		0402DF-701	1 – 3000
0402DF-560	1 – 3000		0402DF-271	1 – 3000		0402DF-771	1 – 3000
0402DF-770	1 – 3000		0402DF-301	1 – 3000		0402DF-901	1 – 3000
0402DF-900	1 - 3000		0402DF-331	1 – 3000		0402DF-102	1 – 450
0402DF-101	1 – 3000		0402DF-361	1 – 3000		0402DF-222	1 – 450
0402DF-121	1 – 3000		0402DF-421	1 – 3000		0402DF-332	1 – 100
0402DF-141	1 – 3000		0402DF-471	1 – 3000			
0402DF-151	1 – 3000		0402DF-531	1 – 3000			

How to use the files

The chip inductor data file names have the format XXWWZZZ.S2P:

- XX = the first two digits of the inductor part number
- WW = the specific inductor series (CS, HS, PS, CT, HT, LS)
- ZZZ = the nominal inductance value stated on the data sheet

For example, if you were interested in a Coilcraft 0402DF chip inductor with an inductance of 56 nH, the file you would choose is 0402DF-560.s2p

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
1 0.001 59.879 1.000 -0.036 1.000 -0.036 0.001 59.879
22.19 0.014 83.698 0.999 -0.798 0.999 -0.798 0.014 83.698
43.38 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.

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