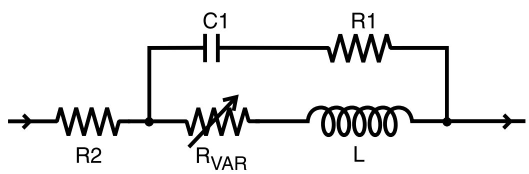
SPICE Model – 0805HT

This lumped-element (SPICE) model data simulates the frequency-dependent behavior of Coilcraft RF surface mount inductors from 1 MHz to the upper frequency limit shown in the accompanying table.

The equivalent lumped element model schematic is shown below. The element values R1, R2, C, and L are listed for each component value. The value of the frequency-dependent variable resistor R_{VAR} relates to the skin effect and is calculated from:

$$R_{VAR} = k * \sqrt{f}$$

- k is shown for each value in the accompanying table.
- f is the frequency in Hz



The data represents de-embedded measurements, as described below. Effects due to different 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 simulation to measurements of the inductors using typical production verification instruments and fixtures.

Each model should only be analyzed at the input and output ports. Individual elements of the model are not determined by parameter measurement. The elements are determined by the overall performance of the lumped element model compared to the measurements taken of the component.

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. Since data sheet specifications are based on typical production measurements, and the SPICE models are based on de-embedded measurements as described below, the model results may be different from the data sheet specifications.

Lumped Element Modeling Method

The measurements were made over a brass ground plane with each component centered over an air gap, as illustrated in Figure 1. 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. The TRL* calibration plane is also illustrated in Figure 1.

Table 1. Test Gap

Size	Gap Width (inch / mm)
0302	0.017 / 0.432
0402,0403	0.017 / 0.432
0603	0.026 / 0.660
0805	0.040 / 1.016
1008	0.060 / 1.524
1206	0.080 / 2.032
1812	0.120 / 3.048

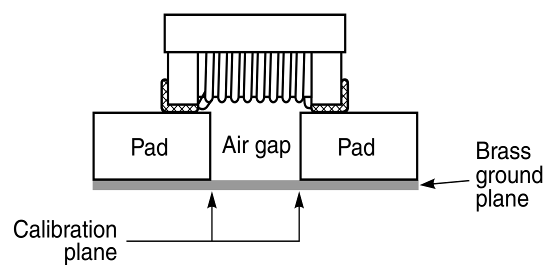


Figure 1. Test Setup

The lumped element values were determined by matching the simulation model to an average of the measurements. This method results in a model that represents as closely as possible the typical frequency-dependent behavior of the component up to a frequency just above the self-resonant frequency of the model.

The lumped element models were used to generate our 2-port S-parameters and therefore give identical results. The S-parameters are available on our web site at **http://www.coilcraft.com/models.cfm**.

Disclaimer

Coilcraft makes every attempt to provide accurate measurement data and software, representative of our components, in a usable format. Coilcraft, however, disclaims all warrants relating to the use of its data and software, whether expressed or implied, including without limitation any implied warranties of merchantability or fitness for a particular purpose. Coilcraft cannot and will not be liable for any special, incidental, consequential, indirect or similar damages occurring with the use of the data and/ or software.

1102 Silver Lake Road Cary, Illinois 60013 **Phone** 847/639-6400 **Fax** 847/639-1469
E-mail info@coilcraft.com **Web** http://www.coilcraft.com

SPICE Model for Coilcraft 0805HT Chip Inductors

Part number	R1 (Ω)	R2 (Ω)	C (pF)	L (nH)	k	Upper limit (MHz)
0805HT-1N8	6	0.03	0.072	1.8	6.04E-06	14700
0805HT-3N9	7	0.05	0.045	4.0	1.22E-05	12500
0805HT-4N7	8	0.06	0.048	4.5	1.36E-05	11400
0805HT-6N8	8	0.08	0.045	6.9	2.11E-05	9500
0805HT-8N2	9	0.08	0.052	8.2	2.50E-05	8100
0805HT-10N	9	0.08	0.088	9.9	2.34E-05	5700
0805HT-12N	10	0.10	0.047	12.0	2.86E-05	7100
0805HT-15N	10	0.10	0.076	14.6	3.14E-05	5100
0805HT-18N	11	0.13	0.053	17.6	3.74E-05	5500
0805HT-22N	11	0.15	0.040	22	4.79E-05	5400
0805HT-27N	16	0.19	0.065	27	5.59E-05	4000
0805HT-33N	20	0.19	0.058	33	6.31E-05	3900
0805HT-39N	24	0.27	0.050	40	7.21E-05	3800
0805HT-47N	28	0.30	0.048	47	1.01E-04	3600

Part number	R1 (Ω)	R2 (Ω)	C (pF)	L (nH)	k	Upper limit (MHz)
0805HT-56N	20	0.39	0.050	56	1.17E-04	3200
0805HT-68N	16	0.40	0.061	68	1.44E-04	2600
0805HT-82N	18	0.44	0.051	81	1.72E-04	2600
0805HT-R10	20	0.64	0.059	101	1.84E-04	2200
0805HT-R12	22	0.68	0.056	120	1.96E-04	2100
0805HT-R15	25	0.80	0.054	146	1.98E-04	1900
0805HT-R18	24	0.86	0.054	179	3.17E-04	1700
0805HT-R22	34	1.29	0.064	215	2.44E-04	1500
0805HT-R27	25	1.40	0.034	268	4.32E-04	1500
0805HT-R33	36	1.93	0.048	326	4.85E-04	1300
0805HT-R39	36	2.80	0.047	384	6.05E-04	1200
0805HT-R47	145	3.10	0.043	462	7.37E-04	1100
0805HT-R50	7	3.20	0.045	491	1.27E-03	1050

Coilcraft®
1102 Silver Lake Road Cary, Illinois 60013 **Phone** 847/639-6400 **Fax** 847/639-1469
E-mail info@coilcraft.com **Web** http://www.coilcraft.com