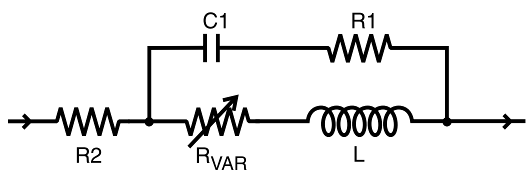
SPICE Model – 1008HS

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

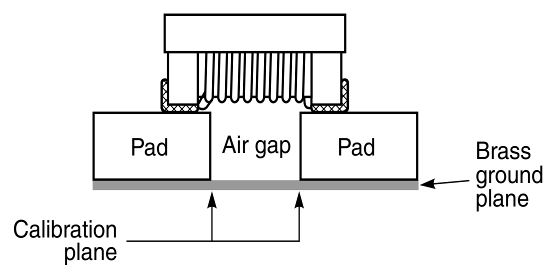


Figure 1. Test Setup

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

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SPICE Model for Coilcraft 1008HS Chip Inductors

Part number	R1 (Ω)	R2 (Ω)	C (pF)	L (nH)	k	Upper limit (MHz)
1008HS-100	8	0.10	0.065	9.8	1.96E-05	6700
1008HS-120	7	0.10	0.100	12.0	2.40E-05	4900
1008HS-150	7	0.10	0.153	15.0	3.12E-05	3700
1008HS-180	7	0.10	0.083	18.0	3.16E-05	4600
1008HS-220	8	0.10	0.124	22.0	3.69E-05	3400
1008HS-270	8	0.10	0.185	27.0	4.41E-05	2500
1008HS-330	9	0.10	0.117	33.0	5.18E-05	2900
1008HS-390	9	0.20	0.149	39.0	5.50E-05	2300
1008HS-470	9	0.20	0.118	47.0	6.40E-05	2400
1008HS-560	7	0.20	0.160	56.0	7.40E-05	1900
1008HS-680	6	0.20	0.137	68.0	9.20E-05	1900
1008HS-820	12	0.20	0.179	81.0	1.15E-04	1500
1008HS-101	13	0.60	0.135	100	1.25E-04	1600
1008HS-121	13	0.60	0.136	120	1.51E-04	1400
1008HS-151	14	0.70	0.136	150	1.10E-04	1300
1008HS-181	18	0.80	0.130	180	1.40E-04	1200
1008HS-221	18	0.80	0.147	224	1.90E-04	1000
1008HS-271	19	0.90	0.144	265	2.32E-04	900
1008HS-331	20	1.10	0.132	330	2.84E-04	900
1008HS-391	27	1.10	0.138	380	3.49E-04	800
1008HS-471	31	1.20	0.156	465	4.27E-04	700
1008HS-561	36	1.30	0.172	550	5.18E-04	600
1008HS-621	37	1.40	0.143	615	5.74E-04	600
1008HS-681	37	1.50	0.139	665	6.10E-04	600
1008HS-751	44	1.50	0.138	740	6.90E-04	600
1008HS-821	41	1.60	0.135	810	8.10E-04	600
1008HS-911	53	1.70	0.155	895	7.80E-04	500
1008HS-102	90	1.80	0.209	975	8.20E-04	400

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