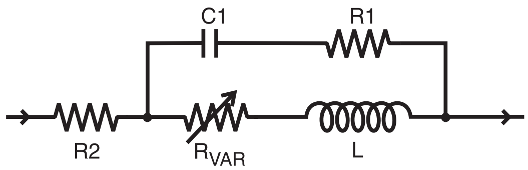
SPICE Model – 0805CS

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.

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)
016008	0.0055 / 0.140
0201	0.010 / 0.254
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

Lumped Element Modeling

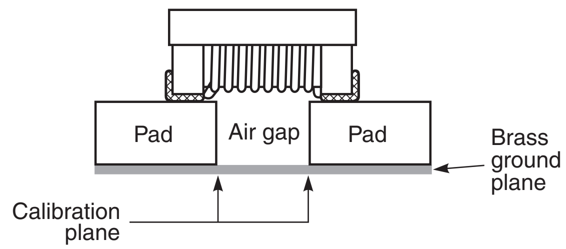


Figure 1. Test Setup

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 **https://www.coilcraft.com/en-us/models/spice**.

Disclaimer

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SPICE Model for Coilcraft 0805CS Chip Inductors

Part number	R1 (Ω)	R2 (Ω)	C (pF)	L (nH)	k	Upper limit (MHz)
0805CS-020	1	0.06	0.038	2.75	6.40E-06	17200
0805CS-3N0	2	0.06	0.040	3.00	8.90E-06	16000
0805CS-030	3	0.08	0.042	3.30	1.22E-05	14900
0805CS-050	4	0.08	0.051	5.66	1.36E-05	10400
0805CS-060	5	0.11	0.041	6.72	2.07E-05	10600
0805CS-070	5	0.14	0.065	7.65	2.22E-05	7900
0805CS-080	7	0.12	0.076	8.05	2.34E-05	7100
0805CS-100	6	0.10	0.047	10.0	1.72E-05	8100
0805CS-120	12	0.15	0.051	12.0	2.44E-05	7100
0805CS-150	10	0.17	0.096	15.0	3.04E-05	4700
0805CS-180	10	0.20	0.059	18.0	3.69E-05	5400
0805CS-220	12	0.22	0.093	22.0	4.17E-05	3900
0805CS-240	12	0.22	0.110	24.0	5.01E-05	3500
0805CS-270	14	0.25	0.067	27.0	5.15E-05	4200
0805CS-330	12	0.27	0.097	33.0	5.71E-05	3100
0805CS-360	13	0.27	0.126	36.0	6.71E-05	2700
0805CS-390	13	0.29	0.082	39.0	6.81E-05	3400
0805CS-430	15	0.31	0.084	43.0	7.51E-05	3200
0805CS-470	10	0.31	0.111	47.0	8.31E-05	2700
0805CS-560	13	0.34	0.094	56.0	1.01E-04	2700
0805CS-680	12	0.38	0.088	67.0	1.20E-04	2500
0805CS-820	15	0.42	0.088	81.0	1.34E-04	2300
0805CS-910	12	0.48	0.083	90.0	1.40E-04	2300
0805CS-101	14	0.46	0.089	99.0	1.56E-04	2100
0805CS-111	15	0.48	0.109	109	1.52E-04	1800
0805CS-121	18	0.51	0.095	119	1.72E-04	1800
0805CS-151	24	0.56	0.110	149	2.23E-04	1500
0805CS-181	18	0.64	0.090	178	2.75E-04	1600
0805CS-221	26	0.70	0.086	215	3.40E-04	1500
0805CS-241	27	1.0	0.098	235	3.80E-04	1300
0805CS-271	31	1.0	0.098	263	3.90E-04	1200
0805CS-331	31	1.4	0.096	320	4.74E-04	1100
0805CS-391	33	1.5	0.095	380	5.78E-04	1100
0805CS-471	66	1.8	0.132	470	6.14E-04	800
0805CS-561	66	1.9	0.258	560	5.54E-04	600
0805CS-681	88	2.2	0.542	680	7.14E-04	400
0805CS-821	125	2.4	0.255	820	9.80E-04	500
0805CS-102	75	2.5	0.462	1000	6.70E-04	500
0805CS-122	60	3.0	0.288	1200	9.70E-04	500
0805CS-152	30	1.0	2.420	1500	1.20E-03	150
0805CS-182	25	2.0	2.550	1800	1.00E-03	150
0805CS-222	40	2.0	0.700	2200	2.20E-03	250
0805CS-272	60	3.0	0.604	2700	2.80E-03	250
0805CS-332	75	5.0	0.436	3300	3.00E-03	250
0805CS-472	50	4.0	0.885	4700	3.60E-03	250
0805CS-562	80	5.0	0.986	5600	4.80E-03	150
0805CS-682	100	7.0	0.575	6800	6.10E-03	150
0805CS-822	100	10	0.741	8200	7.20E-03	100
0805CS-103	150	12	0.580	10000	7.50E-03	100

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