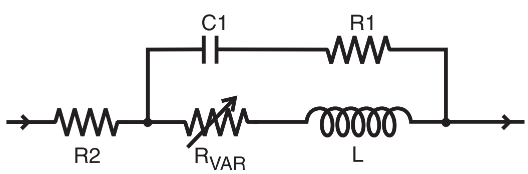
SPICE Model – 0201DS

This lumped-element (SPICE) model data simulates the frequency-dependent behavior of Coilcraft RF surface mount inductors within the frequency limits 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



Each model should be analyzed only at the input and output ports. Conclusions based on individual lumped element values may be erroneous.

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.

Lumped Element Modeling Method

The measurements were made over a brass ground plane with each component centered over an 0.010 inch (0.254 mm) air gap, as illustrated in Figure 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.

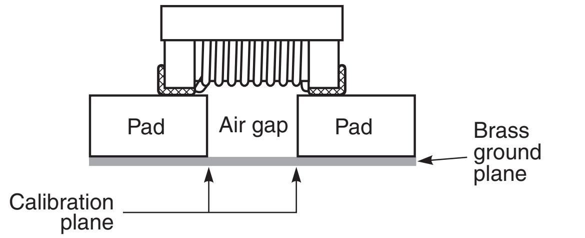


Figure 1. Test Setup

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 0201DS Chip Inductors

Part number	Frequency limit of model (GHz) Lower	Upper	R1 (Ω)	R2 (Ω)	C (pf)	L (nH)	k
0201DS-0N5	0.001	26	15	0.020	0.032	0.50	2.60E-06
0201DS-0N6	0.001	26	15	0.030	0.030	0.60	2.40E-06
0201DS-1N3	0.001	26	15	0.048	0.023	1.3	4.80E-06
0201DS-1N4	0.001	26	15	0.080	0.020	1.4	7.40E-06
0201DS-1N5	0.001	26	15	0.090	0.021	1.5	7.30E-06
0201DS-2N2	0.001	20	14	0.070	0.027	2.2	9.45E-06
0201DS-2N3	0.001	20	13	0.070	0.028	2.3	7.40E-06
0201DS-2N4	0.001	20	8.0	0.082	0.026	2.4	9.80E-06
0201DS-2N5	0.001	20	13	0.165	0.025	2.5	1.02E-05
0201DS-3N3	0.001	16	10	0.080	0.032	3.3	1.20E-05
0201DS-3N4	0.001	16	16	0.080	0.030	3.4	1.23E-05
0201DS-3N5	0.001	16	11	0.080	0.030	3.5	1.23E-05
0201DS-3N6	0.001	16	10	0.105	0.030	3.6	1.30E-05
0201DS-3N7	0.001	16	10	0.105	0.029	3.7	1.40E-05
0201DS-3N8	0.001	16	17	0.180	0.027	3.8	1.25E-05
0201DS-3N9	0.001	16	20	0.240	0.025	3.9	1.40E-05
0201DS-4N8	0.001	16	5.0	0.096	0.032	4.8	2.30E-05
0201DS-4N9	0.001	16	19	0.130	0.031	4.9	2.20E-05
0201DS-5N0	0.001	16	25	0.130	0.029	5.0	2.31E-05
0201DS-5N1	0.001	16	11	0.130	0.030	5.1	2.19E-05
0201DS-5N2	0.001	16	11	0.170	0.028	5.2	2.10E-05
0201DS-5N3	0.001	16	10	0.130	0.028	5.3	2.20E-05
0201DS-5N4	0.001	16	8.0	0.130	0.036	5.4	2.10E-05
0201DS-5N5	0.001	16	10	0.285	0.026	5.5	2.10E-05
0201DS-6N7	0.001	15	18	0.150	0.034	6.7	2.60E-05
0201DS-6N8	0.001	15	17	0.150	0.040	6.8	2.80E-05
0201DS-6N9	0.001	15	18	0.150	0.042	6.9	2.81E-05
0201DS-7N0	0.001	15	20	0.210	0.031	7.0	2.50E-05
0201DS-7N1	0.001	15	19	0.150	0.030	7.1	2.80E-05
0201DS-7N2	0.001	14	13	0.250	0.024	7.2	2.80E-05
0201DS-7N3	0.001	14	15	0.250	0.028	7.3	2.94E-05
0201DS-7N4	0.001	14	13	0.250	0.034	7.4	2.42E-05
0201DS-7N5	0.001	14	15	0.340	0.029	7.5	2.90E-05
0201DS-7N6	0.001	14	15	0.300	0.024	7.6	2.67E-05
0201DS-7N7	0.001	14	13	0.300	0.024	7.7	2.54E-05
0201DS-7N8	0.001	14	16	0.300	0.028	7.8	2.67E-05
0201DS-7N9	0.001	14	16	0.300	0.031	7.9	2.67E-05
0201DS-8N0	0.001	14	17	0.300	0.028	8.0	2.80E-05
0201DS-8N1	0.001	13	20	0.300	0.023	8.1	2.67E-05
0201DS-8N2	0.001	13	17	0.270	0.039	8.2	3.20E-05
0201DS-8N3	0.001	13	20	0.300	0.034	8.3	2.80E-05
0201DS-8N4	0.001	13	25	0.350	0.031	8.4	2.94E-05
0201DS-8N5	0.001	13	25	0.350	0.030	8.5	2.94E-04
0201DS-8N7	0.001	12	23	0.350	0.033	8.7	3.00E-05
0201DS-9N0	0.001	11	25	0.350	0.034	9.0	2.75E-05
0201DS-9N4	0.001	11	30	0.400	0.029	9.4	3.60E-05
0201DS-9N6	0.001	11	32	0.400	0.027	9.6	3.50E-05
0201DS-11N	0.001	10	32	0.400	0.030	11	3.50E-05
0201DS-12N	0.001	10	38	0.360	0.028	12	4.50E-05
0201DS-13N	0.001	10	35	0.440	0.030	13	4.50E-05
0201DS-14N	0.001	10	28	0.440	0.033	14	5.60E-05