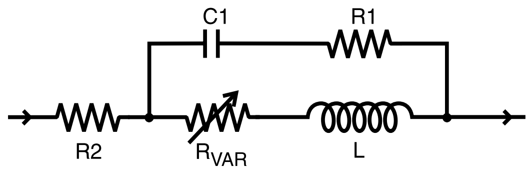
SPICE Model – 1812LS

This lumped-element (SPICE) model data simulates the frequency-dependent behavior of Coilcraft RF surface mount inductors from 100 kHz 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

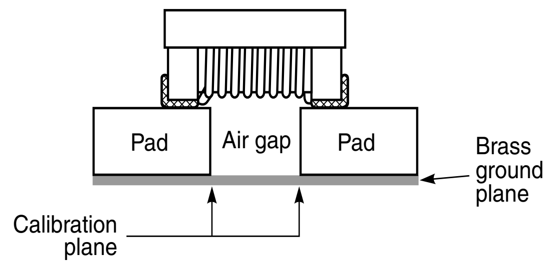


Figure 1. Test Setup

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

© Coilcraft, Inc. 2009

SPICE Model for Coilcraft 1812LS Chip Inductors

Part number	R1 (Ω)	R2 (Ω)	C (pF)	L (µH)	k	Upper limit (MHz)
1812LS-123	284	2.0	0.29	12	5.27E-03	94
1812LS-153	292	2.0	0.26	15	6.53E-03	89
1812LS-183	208	2.0	0.37	18	6.73E-03	68
1812LS-223	324	3.0	0.26	22	8.93E-03	73
1812LS-273	374	3.0	0.39	27	9.33E-03	54
1812LS-333	354	4.0	0.47	33	9.73E-03	45
1812LS-393	444	4.0	0.57	39	9.93E-03	37
1812LS-473	408	5.0	0.92	47	9.93E-03	27
1812LS-563	552	5.0	1.16	55	1.01E-02	22
1812LS-683	370	6.0	1.64	66	1.08E-02	17
1812LS-823	335	7.0	1.96	79	1.17E-02	14
1812LS-104	433	8.0	1.59	97	1.47E-02	14
1812LS-124	596	11.0	0.87	120	1.98E-02	17
1812LS-154	434	13.0	1.50	150	1.98E-02	12
1812LS-184	518	14.0	1.79	178	2.05E-02	10
1812LS-224	469	16.0	2.17	218	2.31E-02	8
1812LS-274	573	20.0	1.59	268	3.01E-02	9
1812LS-334	517	22.0	1.70	325	3.63E-02	8
1812LS-394	517	24.0	2.37	382	4.26E-02	6
1812LS-474	414	26.0	2.66	455	4.51E-02	5
1812LS-564	238	28.0	6.09	515	4.77E-02	3
1812LS-684	217	38.0	6.36	615	5.05E-02	3
1812LS-824	206	41.0	7.71	705	6.31E-02	3
1812LS-105	220	44.0	9.65	820	7.00E-02	2

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

© Coilcraft, Inc. 2009