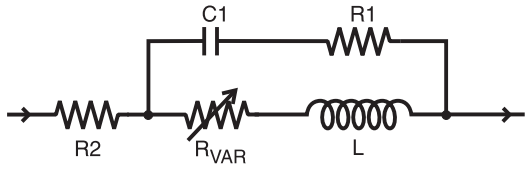
SPICE Model – 016008C

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

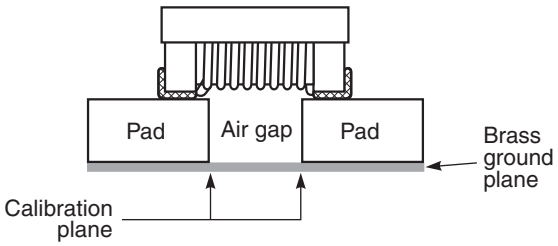


Figure 1. Test Setup

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 016008C Chip Inductors

Part number	R1 (Ω)	R2 (Ω)	C (pF)	L (nH)	k	Upper limit (MHz)
016008C-N45	126.1	0.040	0.0560	0.5	1.22E-06	26500
016008C-N50	63.1	0.050	0.0350	0.5	1.70E-06	26500
016008C-1N1	19.4	0.080	0.0430	1.1	2.78E-06	24000
016008C-1N2	14.0	0.100	0.0450	1.2	3.58E-06	23000
016008C-1N3	15.0	0.150	0.0390	1.3	4.30E-06	23000
016008C-2N0	5.0	0.100	0.0520	2.0	8.20E-06	18000
016008C-2N2	14.8	0.130	0.0350	2.2	8.40E-06	18000
016008C-2N4	18.6	0.210	0.0420	2.4	1.10E-05	16000
016008C-3N3	11.1	0.130	0.0460	3.3	1.38E-05	14000
016008C-3N6	20.4	0.190	0.0390	3.6	1.72E-05	14000
016008C-3N8	15.0	0.260	0.0380	3.8	1.68E-05	14000
016008C-3N9	7.5	0.380	0.0340	3.9	1.82E-05	14000
016008C-4N3	13.9	0.160	0.0410	4.3	1.82E-05	13000
016008C-4N7	8.9	0.220	0.0380	4.7	1.70E-05	13000

Part number	R1 (Ω)	R2 (Ω)	C (pF)	L (nH)	k	Upper limit (MHz)
016008C-5N1	17.8	0.280	0.0450	5.1	1.98E-05	12000
016008C-5N3	10.9	0.360	0.0380	5.3	2.55E-05	12000
016008C-5N8	14.9	0.210	0.0350	5.8	2.37E-05	12000
016008C-6N0	11.4	0.290	0.0330	6.0	2.45E-05	12000
016008C-6N2	18.0	0.340	0.0330	6.2	2.49E-05	12000
016008C-6N8	21.0	0.420	0.0360	6.8	2.85E-05	11000
016008C-6N9	17.2	0.420	0.0370	6.9	2.85E-05	11000
016008C-7N8	13.6	0.340	0.0400	7.8	3.33E-05	10000
016008C-8N2	25.0	0.390	0.0370	8.2	3.68E-05	10000
016008C-8N8	29.0	0.500	0.0350	8.8	3.93E-05	10000
016008C-10N	14.5	0.450	0.0330	10.0	4.53E-05	9000
016008C-13N	2.8	0.640	0.0360	13.0	5.97E-05	8000
016008C-15N	1.3	0.710	0.0360	15.0	7.75E-05	8000

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