

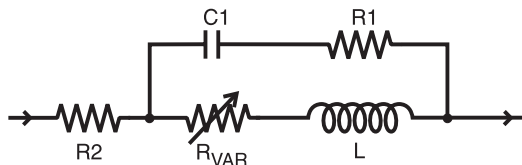
SPICE Model – xx450RAB

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

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

(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.

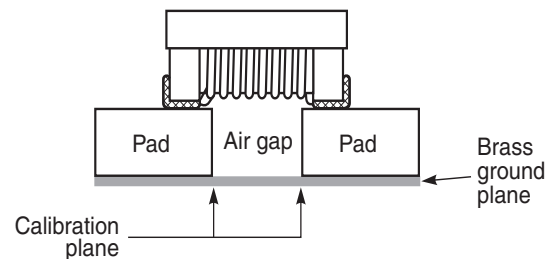


Figure 1. Test Setup

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 xx450RAB Chip Inductors

Part number	R1 (Ω)	R2 (Ω)	C (pF)	L (μH)	k	Upper limit (MHz)	Part number	R1 (Ω)	R2 (Ω)	C (pF)	L (μH)	k	Upper limit (MHz)
xx450RAB123	284	2.0	0.29	12	5.27E-03	94	xx450RAB124	596	11.0	0.87	120	1.98E-02	17
xx450RAB153	292	2.0	0.26	15	6.53E-03	89	xx450RAB154	434	13.0	1.50	150	1.98E-02	12
xx450RAB183	208	2.0	0.37	18	6.73E-03	68	xx450RAB184	518	14.0	1.79	178	2.05E-02	10
xx450RAB223	324	3.0	0.26	22	8.93E-03	73	xx450RAB224	469	16.0	2.17	218	2.31E-02	8
xx450RAB273	374	3.0	0.39	27	9.33E-03	54	xx450RAB274	573	20.0	1.59	268	3.01E-02	9
xx450RAB333	354	4.0	0.47	33	9.73E-03	45	xx450RAB334	517	22.0	1.70	325	3.63E-02	8
xx450RAB393	444	4.0	0.57	39	9.93E-03	37	xx450RAB394	517	24.0	2.37	382	4.26E-02	6
xx450RAB473	408	5.0	0.92	47	9.93E-03	27	xx450RAB474	414	26.0	2.66	455	4.51E-02	5
xx450RAB563	552	5.0	1.16	55	1.01E-02	22	xx450RAB564	238	28.0	6.09	515	4.77E-02	3
xx450RAB683	370	6.0	1.64	66	1.08E-02	17	xx450RAB684	217	38.0	6.36	615	5.05E-02	3
xx450RAB823	335	7.0	1.96	79	1.17E-02	14	xx450RAB824	206	41.0	7.71	705	6.31E-02	3
xx450RAB104	433	8.0	1.59	97	1.47E-02	14	xx450RAB105	220	44.0	9.65	820	7.00E-02	2



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