

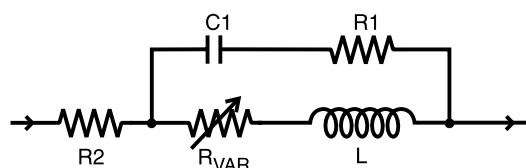
SPICE Model – 1008CS

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.

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.

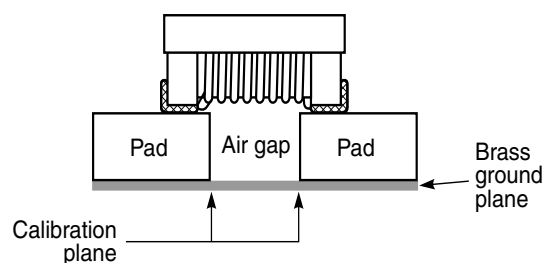


Figure 1. Test Setup

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>.

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SPICE Model for Coilcraft 1008CS Chip Inductors

Part number	R1 (Ω)	R2 (Ω)	C (pF)	L (nH)	k	Upper limit (MHz)	Part number	R1 (Ω)	R2 (Ω)	C (pF)	L (nH)	k	Upper limit (MHz)
1008CS-100	8	0.10	0.065	9.8	1.96E-05	6700	1008CS-471	31	1.20	0.156	465	4.27E-04	700
1008CS-120	7	0.10	0.100	12.0	2.40E-05	4900	1008CS-561	36	1.30	0.172	550	5.18E-04	600
1008CS-150	7	0.10	0.153	15.0	3.12E-05	3700	1008CS-621	37	1.40	0.143	615	5.74E-04	600
1008CS-180	7	0.10	0.083	18.0	3.16E-05	4600	1008CS-681	37	1.50	0.139	665	6.10E-04	600
1008CS-220	8	0.10	0.124	22.0	3.69E-05	3400	1008CS-751	44	1.50	0.138	740	6.90E-04	600
1008CS-270	8	0.10	0.185	27.0	4.41E-05	2500	1008CS-821	41	1.60	0.135	810	8.10E-04	600
1008CS-330	9	0.10	0.117	33.0	5.18E-05	2900	1008CS-911	53	1.70	0.155	895	7.80E-04	500
1008CS-390	9	0.20	0.149	39.0	5.50E-05	2300	1008CS-102	90	1.80	0.209	975	8.20E-04	400
1008CS-470	9	0.20	0.118	47.0	6.40E-05	2400	1008CS-122	73	2.00	0.201	1215	1.05E-03	400
1008CS-560	7	0.20	0.160	56.0	7.40E-05	1900	1008CS-152	83	2.30	0.249	1515	1.71E-03	300
1008CS-680	6	0.20	0.137	68.0	9.20E-05	1900	1008CS-182	85	2.60	0.278	1825	2.04E-03	300
1008CS-820	12	0.20	0.179	81.0	1.15E-04	1500	1008CS-222	84	2.80	0.258	2200	2.46E-03	300
1008CS-101	13	0.60	0.135	100	1.25E-04	1600	1008CS-272	112	3.20	0.398	2700	2.55E-03	200
1008CS-121	13	0.60	0.136	120	1.51E-04	1400	1008CS-332	134	3.40	0.285	3300	3.27E-03	200
1008CS-151	14	0.70	0.136	150	1.10E-04	1300	1008CS-392	121	3.60	0.401	3900	4.23E-03	200
1008CS-181	18	0.80	0.130	180	1.40E-04	1200	1008CS-472	163	4.00	0.381	4600	5.00E-03	200
1008CS-221	18	0.80	0.147	224	1.90E-04	1000	1008CS-562	64	4.00	5.304	5250	3.04E-03	100
1008CS-271	19	0.90	0.144	265	2.32E-04	900	1008CS-682	148	4.90	1.357	6800	3.54E-03	100
1008CS-331	20	1.10	0.132	330	2.84E-04	900	1008CS-822	134	6.00	2.911	8200	4.38E-03	100
1008CS-391	27	1.10	0.138	380	3.49E-04	800							



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