

# SPICE Model – DS1608

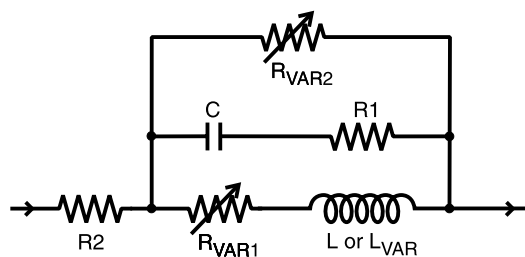
This lumped-element (SPICE) model data simulates the frequency-dependent behavior of Coilcraft power inductors within the frequency range shown in the accompanying table for each individual inductor.

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 other production verification instruments and fixtures.

## Lumped Element Modeling Method

Measurements were made using a 50 Ohm impedance analyzer. Fixture compensation was performed to remove fixture effects. No DC bias current was applied in any of the measurements. The lumped element values were determined by optimizing 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 within the model frequency range.

The equivalent lumped element model schematic is shown below. Each model should be analyzed only at the input and output ports. Conclusions based on individual lumped element values may be erroneous.



The value of the frequency-dependent variable resistor  $R_{VAR1}$  is calculated from:

$$R_{VAR1} = k1 * \sqrt{f}$$

- $k1$  is shown for each value in the accompanying table.
- $f$  is the frequency in Hz
- $R_{VAR1}$  is the resistance in Ohms

The value of the frequency-dependent variable resistor  $R_{VAR2}$  is calculated from:

$$R_{VAR2} = k2 * \sqrt{f}$$

- $k2$  is shown for each value in the accompanying table.
- $f$  is the frequency in Hz
- $R_{VAR2}$  is the resistance in Ohms

For some part numbers, two models are provided: one using a variable inductance element ( $L_{VAR}$ ) and the other using a fixed inductance value ( $L$ ). Chose the one whose frequency range best suits your application.

The value of the frequency-dependent inductance  $L_{VAR}$  is calculated from:

$$L_{VAR} = k3 - k4 * \text{LOG}(k5 * f)$$

- $k3$ ,  $k4$ , and  $k5$  are shown in the accompanying table.
- $f$  is the frequency in Hz
- $L_{VAR}$  is the inductance in  $\mu\text{H}$

## Disclaimer

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# SPICE Model for Coilcraft DS1608 Power Inductors

Part number	Frequency limit of model (MHz)		R1 ( $\Omega$ )	R2 ( $\Omega$ )	C (pF)	k1	k2	L <sub>VAR</sub> Coefficients			L ( $\mu$ H)
	Lower	Upper						k3	k4	k5	
DS1608C-102	0.1	10	1120	0.001	552	4.87E-05	0.193	1.00	1.31E-02	6.61E-06	
DS1608C-152	0.1	10	1120	0.001	552	4.38E-05	0.193	1.50	1.31E-02	9.22E-06	
DS1608C-222	0.1	10	2100	0.001	234	7.86E-05	0.609	2.20	3.60E-02	9.60E-06	
DS1608C-332	0.1	10	2100	0.001	234	7.86E-05	0.609	3.30	4.50E-02	9.60E-06	
DS1608C-472	0.1	6	3400	0.001	277	8.30E-05	0.740	4.70	6.02E-02	9.98E-06	
DS1608C-472	6	10	3810	0.001	2360	4.51E-04	0.737				4.44
DS1608C-682	0.1	10	1850	0.050	263	1.51E-05	1.36	6.80	8.90E-02	1.06E-05	
DS1608C-103	0.1	4.5	3650	0.058	137	1.50E-05	1.78	10.0	1.27E-01	1.02E-05	
DS1608C-103	4.5	10	5030	0.092	0.479	4.37E-05	0.880				9.53
DS1608C-153	0.1	4	3650	0.081	137	1.50E-05	3.91	15.0	1.27E-01	1.08E-05	
DS1608C-153	4	10	100	0.090	1.58	2.85E-03	1.40				14.4
DS1608C-223	0.1	4	4380	0.076	79	1.07E-05	6.71	22.0	2.54E-01	1.06E-05	
DS1608C-223	4	10	190	0.081	1.62	6.65E-04	1.71				20.9
DS1608C-333	0.1	2.5	3910	0.190	11.7	1.37E-07	11.7	33.0	2.54E-01	1.25E-05	
DS1608C-333	2.5	10	190	0.081	1.62	6.11E-04	2.63				31.5
DS1608C-473	0.1	2.5	7820	0.279	37.3	1.30E-07	23.5	47.0	3.93E-01	1.08E-05	
DS1608C-473	2.5	10	190	0.081	1.24	5.21E-03	5.42				45.0
DS1608C-683	0.1	2.5	14000	0.242	28.9	1.37E-07	26.6	68.0	3.28E-01	1.15E-05	
DS1608C-683	2.5	10	1070	0.044	1.52	2.62E-04	8.82				63.6
DS1608C-104	0.1	8	1630	0.048	1.25	3.31E-05	15.7				100
DS1608C-154	0.1	7	815	0.024	1.37	4.19E-05	15.7				150
DS1608C-224	0.1	5	1620	0.002	1.90	5.14E-05	28.6				220
DS1608C-334	0.1	3	4300	0.001	1.76	1.29E-06	47.7				330
DS1608C-474	0.1	2.5	6700	0.001	2.27	1.29E-06	91.7				470
DS1608C-684	0.1	2	9700	0.001	2.07	1.29E-06	141				680
DS1608C-105	0.1	1.5	9200	0.001	2.55	1.29E-06	253				1000
DS1608C-155	0.1	1.5	15400	0.001	2.06	1.29E-06	445				1500
DS1608C-225	0.1	1.5	6200	0.001	2.09	1.29E-06	553				2200
DS1608C-335	0.1	0.75	6920	0.001	3.68	1.29E-06	813				3290
DS1608C-475	0.1	0.75	5920	0.001	3.15	1.29E-06	1410				4680
DS1608C-685	0.1	0.75	3040	0.001	2.24	1.29E-06	1550				6750
DS1608C-106	0.1	0.60	3040	0.001	3.13	1.29E-06	3100				9880



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