

# SPICE Model – LPS4012

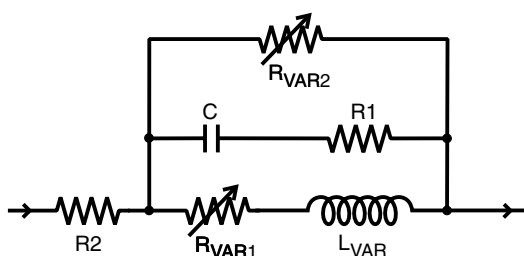
This lumped-element (SPICE) model data simulates the frequency-dependent behavior of Coilcraft power inductors within the frequency range shown in the accompanying table for each individual inductor.

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

Note: The log function in the following equation is the natural logarithm, base e, not base 10.

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  $\mu\text{H}$
- LOG is the natural LOG (base e)

## 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.

**Coilcraft**<sup>®</sup>

Specifications subject to change without notice. Document 267-1 Revised 08/03/07

1102 Silver Lake Road Cary, Illinois 60013 Phone 847/639-6400 Fax 847/639-1469

E-mail [info@coilcraft.com](mailto:info@coilcraft.com) Web <http://www.coilcraft.com>

# SPICE Model for Coilcraft LPS4012 Power Inductors

Part number	Frequency limit of model (MHz)		R1 ( $\Omega$ )	R2 ( $\Omega$ )	C (pF)	k1	k2	L <sub>VAR</sub> Coefficients		
	Lower	Upper						k3	k4	k5
LPS4012-331	0.1	100	220	0.023	1.70	6.00E-05	0.128	0.33	0.007	9.70E-06
LPS4012-681	0.1	200	550	0.055	0.790	2.00E-06	0.191	0.68	0.012	9.70E-06
LPS4012-102	0.1	100	155	0.060	2.06	6.00E-05	0.210	1.0	0.024	9.70E-06
LPS4012-152	0.1	100	160	0.070	2.36	8.00E-05	0.290	1.5	0.034	9.70E-06
LPS4012-222	0.1	100	110	0.100	2.36	9.00E-05	0.425	2.2	0.034	9.60E-06
LPS4012-332	0.1	100	165	0.100	2.35	1.40E-04	0.350	3.3	0.085	9.60E-06
LPS4012-472	0.1	100	165	0.175	2.41	7.00E-05	0.598	4.7	0.085	9.70E-06
LPS4012-562	0.1	100	240	0.260	2.80	5.00E-05	0.695	5.6	0.111	9.80E-06
LPS4012-682	0.1	80	105	0.340	3.36	5.00E-05	1.10	6.8	0.120	9.90E-06
LPS4012-103	0.1	60	400	0.350	2.14	1.00E-05	0.950	10	0.158	9.70E-06
LPS4012-153	0.1	40	300	0.550	3.25	1.00E-06	2.08	15	0.245	9.90E-06
LPS4012-223	0.1	40	200	0.600	3.27	3.50E-04	3.40	22	0.410	9.82E-06
LPS4012-333	0.1	40	16	0.825	1.49	2.00E-04	5.57	33	0.452	9.86E-06
LPS4012-473	0.1	40	55	1.40	1.83	1.00E-06	11.6	47	0.452	9.96E-06
LPS4012-683	0.1	30	170	1.70	1.32	2.00E-05	16.0	68	0.620	9.96E-06
LPS4012-104	0.1	20	1000	2.40	3.12	1.00E-06	18.0	100	0.460	1.00E-05
LPS4012-124	0.1	20	150	3.30	1.93	4.00E-04	30.0	120	1.20	1.00E-05
LPS4012-154	0.1	10	3300	3.50	8.60	1.00E-06	9.05	150	0.800	8.97E-06
LPS4012-184	0.1	10	170	5.00	1.88	1.00E-06	44.0	180	1.23	1.01E-05
LPS4012-224	0.1	8	1080	5.20	5.51	1.00E-06	20.0	220	1.80	1.00E-05
LPS4012-334	0.1	7	1030	7.20	5.34	1.00E-06	30.0	330	3.58	1.02E-05
LPS4012-474	0.1	7	650	10.0	3.17	2.00E-03	82.0	470	4.00	1.05E-05
LPS4012-564	0.1	5	1000	12.5	3.81	1.00E-06	60.0	560	5.80	1.05E-05
LPS4012-684	0.1	5	280	13.5	2.73	1.00E-04	160	680	9.20	1.05E-05
LPS4012-824	0.1	5	280	20.0	3.67	1.00E-04	160	820	8.50	1.11E-05
LPS4012-105	0.1	5	275	21.5	3.03	1.00E-06	204	1000	9.00	1.13E-05
LPS4012-155	0.1	3	1000	35.0	2.95	1.00E-06	250	1500	10.4	1.26E-05
LPS4012-185	0.1	2	2000	36.0	3.30	1.00E-06	173	1800	16.0	1.24E-05
LPS4012-225	0.1	2	5300	40.0	7.72	1.00E-06	100	2200	9.30	3.06E-05
LPS4012-335	0.1	1	2100	76.0	6.93	1.00E-06	310	3300	44	1.89E-05



Specifications subject to change without notice. Document 267-52 Revised 11/01/06

1102 Silver Lake Road Cary, Illinois 60013 Phone 847/639-6400 Fax 847/639-1469

E-mail [info@coilcraft.com](mailto:info@coilcraft.com) Web <http://www.coilcraft.com>