

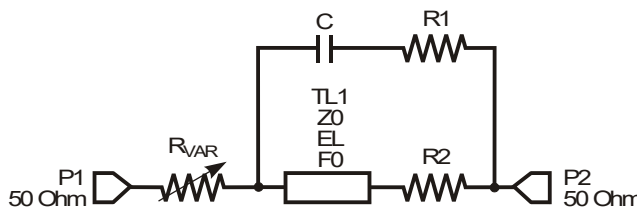
SPICE Model

GA309x, WA309x Air Core Inductors

These transmission line models accurately simulate the frequency-dependent behavior of Coilcraft surface mount mini air core inductors within the frequency limits shown in the accompanying table for each individual inductor. They are based on de-embedded measurements using a 2-port network analyzer.

Effects due to various circuit board traces, board materials, ground planes or interactions with other components are not included. They may have a significant effect when comparing the simulation to measurements of the individual inductors using other production verification instruments and fixtures.

The model schematic, shown below, combines an ideal transmission line model with lumped elements. The individual element values k , $R1$, $R2$, C , $Z0$, EL , and $F0$ are listed in the table for each spring inductor.



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 of the component.

The value of the frequency-dependent variable resistor R_{VAR} relates to the skin effect and is calculated from:

$$R_{VAR} = k \times \sqrt{f}$$

- k is shown for each value in the accompanying table.
- f is the frequency in Hz

Lumped Element Modeling Method

The models were created by matching a simulation model as closely as possible to a 1-port measurement of a typical inductor using an impedance analyzer. The model was then used to create the final 2-port s-parameters. This method results in a model that represents as closely as possible the typical frequency-dependent behavior of the component within the specified frequency limits.

Because our simulation models were used to generate our 2-port s-parameters, they give identical results with the same number of simulation frequency points. The simulation models are available on our web site at <https://www.coilcraft.com/en-us/models/spice/>.

Disclaimer

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SPICE Model for Coilcraft GA309_x / WA309_x Air Core Inductors

Part	Frequency limit of model (MHz)		R1 (Ohm)	R2 (Ohm)	C(pF)	Z0 (Ohm)	EL (Deg.)	F0 (MHz)	k
	Lower	Upper							
GA3092-AL	100	6000	0.001	2.70E-02	0.152	84	31.9	2250	1.00E-09
GA3093-AL	100	6000	0.001	6.00E-02	0.188	120	32.4	1670	1.00E-09
GA3094-AL	100	2500	0.002	1.09E-01	0.440	142	49.8	1642	1.00E-09
GA3095-AL	100	2200	3.374	1.47E-01	0.478	153	68.0	1623	1.00E-09
WA3096-AL	0.1	3000	20	2.50E-03	0.175	330	37.0	1500	9.40E-06
WA3097-AL	0.1	3000	32	3.00E-03	0.213	250	60.0	1400	1.45E-05



www.coilcraft.com

US +1-847-639-6400 sales@coilcraft.com
UK +44-1236-730595 sales@coilcraft-europe.com
Taiwan +886-2-2264 3646 sales@coilcraft.com.tw
China +86-21-6218 8074 sales@coilcraft.com.cn
Singapore + 65-6484 8412 sales@coilcraft.com.sg

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