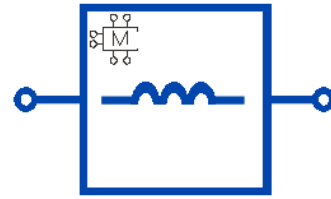


- ### Model Features
- Broadband (DC to 20GHz)
 - Equivalent circuit based
 - Substrate scalable ($1.7 \leq H/Er \leq 16.4$)
 - Part Value Scalable (1.2 to 15 nH)
 - Accurate effective series resistance
 - Developed for microstrip interconnects



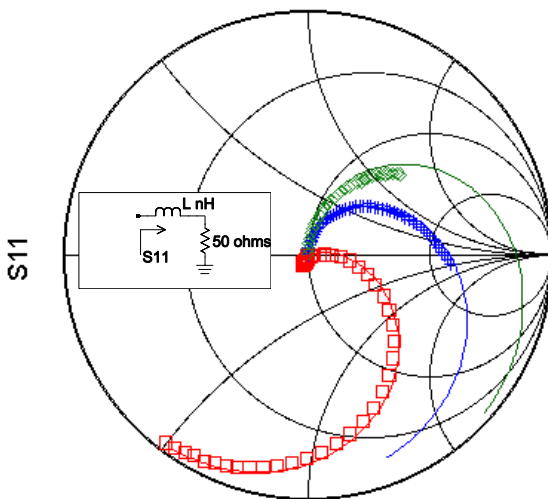
IND-AVX-0603-001
(1.2 to 15 nH)
0603 Body Style

Model Description

The IND-AVX-0603-001 is a substrate scalable Global Model™ for the AVX P/N Accu-L 0603 series surface mount chip inductor family (additional information is available at www.avx.com). A single, substrate scalable Global Model™ is available which accurately emulates all inductor values within the valid inductance range. The models are for use with microstrip applications and account for substrate (or printed circuit board) related parasitic effects. Substrate height, dielectric constant, loss tangent, interconnect metal thickness, pad length, pad width, pad gap and component tolerance are model input parameters. Models account for up to two higher-order resonant frequency pairs beyond the fundamental parallel resonant frequency. Accurate effective series resistance (ESR) is modeled over the frequency range. A Sim_mode switch allows pad stack effects to be disabled.

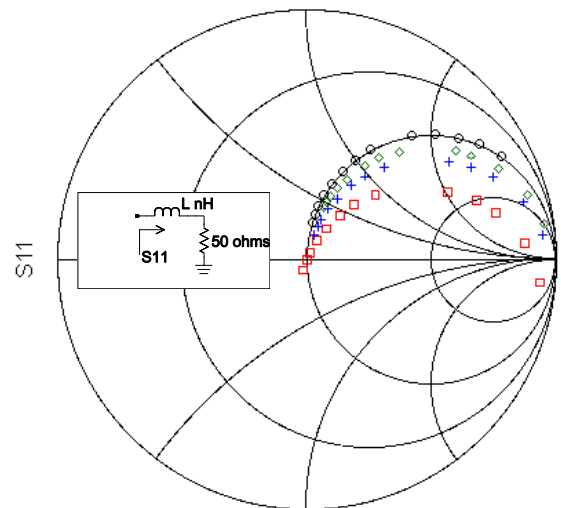
The pad dimensions used to develop datasheet plots for the model are: length = 0.95 mm, width = 1 mm, gap = 0.65 mm.

Frequency Sweep



Legend: □ 6.6mil Rogers 4350B, + 20mil Rogers 4003C, ◇ 60mil Rogers 4003C, Lines - Model, Symbols - Measured data. Measured data stops at highest valid frequency for each substrate. S11 for 1.2nH inductor mounted on various substrates from 0.045 to 20 GHz.

Part Value Sweep

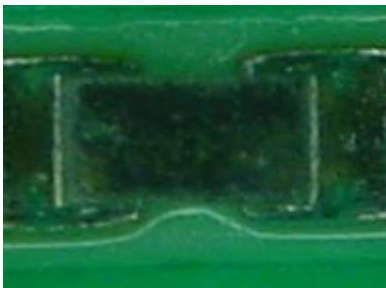


Legend: □ 6.6mil Rogers 4350B, + 20mil Rogers 4003C, ◇ 60mil Rogers 4003C, O Ideal. Model S11 at 2 GHz for inductor values from 1.2 to 15 nH on various substrates compared to an ideal inductor response.

Technical Notes

- Two-port S-parameters were measured using a vector network analyzer and on-board probing with calibration referenced to the outside edges of the component pad stack.
- Inductors were measured in a 2-port series configuration using a 50-ohm microstrip test fixture. Models for alternative interconnect configurations (e.g. coplanar waveguide) are available upon request.
- The models were developed using the following land pattern dimensions: PADL = 37.4 mils, PADW = 39.4 mils, PADG = 25.6 mils. The pad scalable models are then validated with S-parameter measurements within the recommended pad range.
- Substrates used to extract the models: 6.6mil Rogers 4350B, 20mil Rogers 4003C, 60mil Rogers 4003C.
- Typical range of valid substrate types (substrate height H in mils and dielectric constant Er):
 $1.7 \leq H/Er \leq 16.4$.
- Effective series resistance (ESR) was measured using a 4291A impedance analyzer and 16197 Agilent test fixture.
- Highest frequency for measurement validation: 6GHz (60mil Rogers 4003C), 12 GHz (20mil Rogers 4003C), 20 GHz (6.6mil Rogers 4350B).
- Multiple simulation modes (Sim_mode) are available - full mode, ideal mode and no pad stack.

Device Image

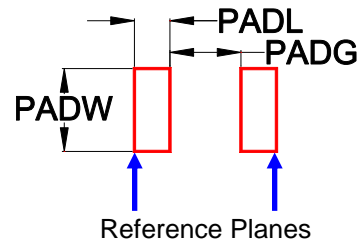


Inductor Values (nH)

1.2	1.5	1.8	2.2	2.7	3.3	3.9
4.7	5.6	6.8	8.2	10	12	15

Highlighted inductor values are measurement-based models. Other models found via interpolation. Table shows 14 part values in the model range based on manufacturer's datasheet.

PC Board Footprint



$$29.5 (0.75) \leq \text{PADL} \leq 45.3 (1.15)$$

$$31.1 (0.79) \leq \text{PADW} \leq 43.3 (1.1)$$

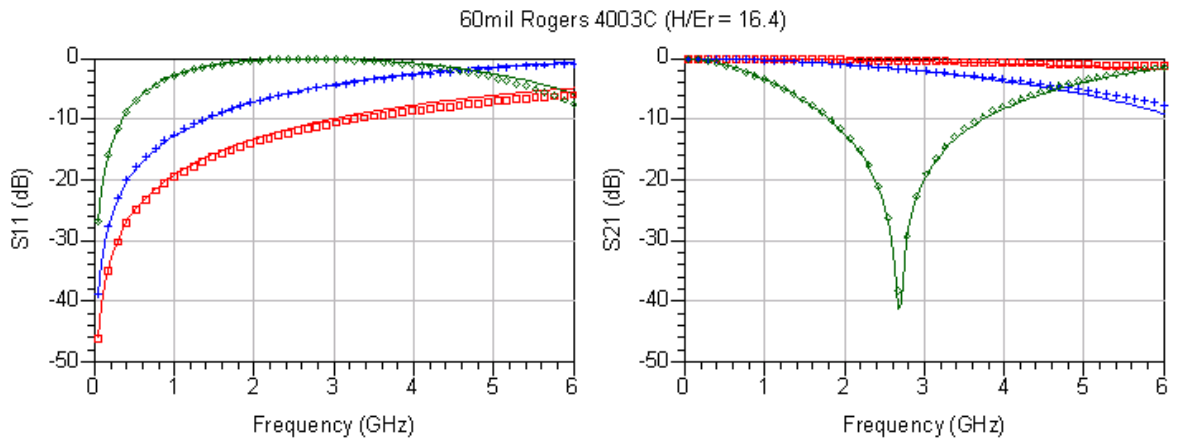
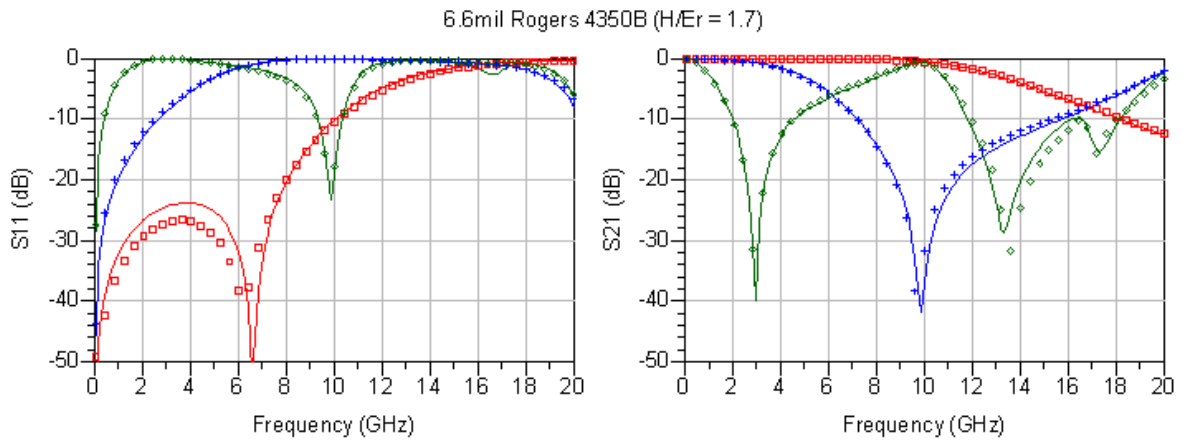
$$20.1 (0.51) \leq \text{PADG} \leq 25.6 (0.65)$$

Units in mils (mm)

Model Input Parameters

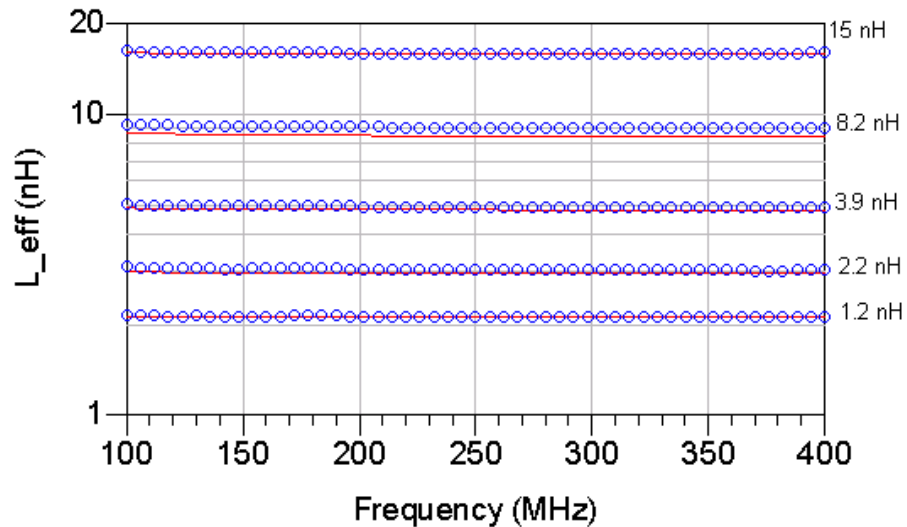
- L - Nominal component value in nH. The full parasitic model is invoked if the part value is within the valid limits of the model, otherwise an ideal element model is used.
- Subst - Microstrip substrate instance name. The model will reference the named substrate instance to obtain values for H, Er, T and TanD.
- Sim_mode - 0 for full parasitic model, 1 for ideal element, 2 for removing pad effects.
- Tolerance - Tolerance of the part value. The nominal value for this parameter should be set to 1. Use for statistical distribution.
- Pad_mode - 0 for default to Sim_mode, 1 for pads always in layout, 2 for pads never in layout
- Pad_Width - Width of land pattern footprint
- Pad_Length - Length of land pattern footprint
- Pad_Gap - pad-to-pad spacing (edge to edge)

Series 2-port S-parameter: Model vs. Measured Data



Legend: □ 1.2 nH, + 3.3 nH, ◇ 15 nH, Solid lines - Model data, Symbols - Measured data

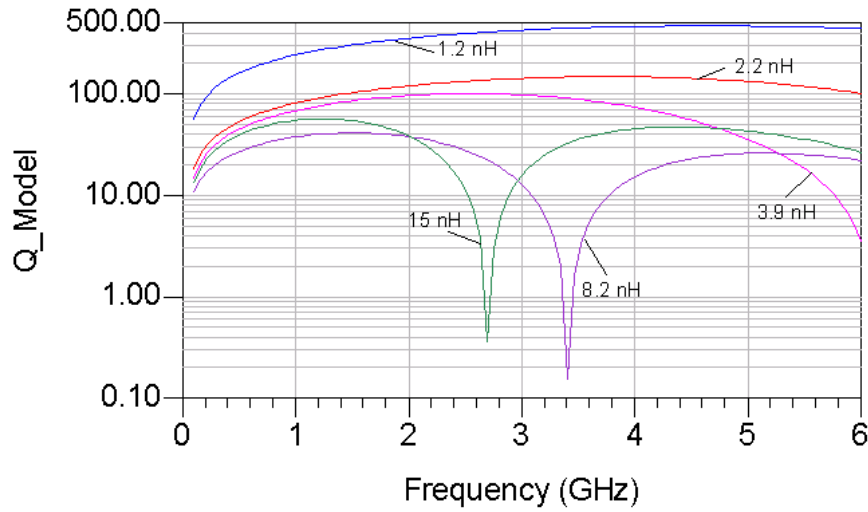
Effective Inductance



Legend: — Red solid lines - Model response on 60mil Rogers 4003C
○ Blue symbols - Measurement on 60mil Rogers 4003C
 Note: Plot is based on randomly selected part values from 1.2 – 15 nH.



Model Q-Factor

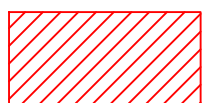
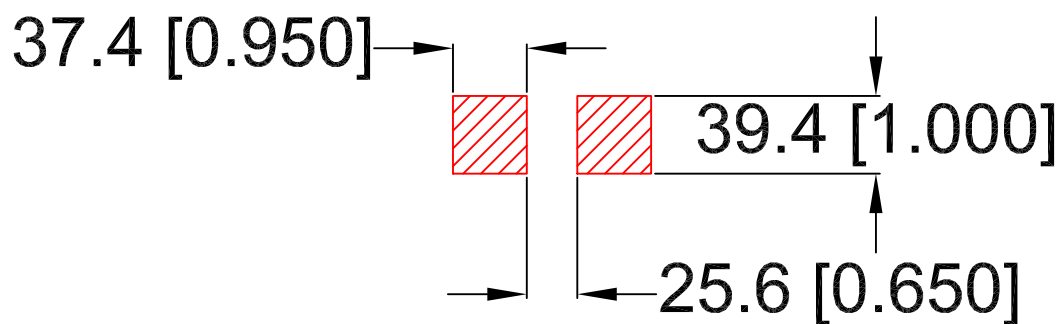


Legend: solid lines - Model response 60mil Rogers 4003C
Note: Plot is based on randomly selected part values from 1.2 – 15 nH.

Model and Datasheet Revision Notes

02/13/2014 Original model and datasheet development

NOMINAL FOOTPRINT



Denotes plated copper land pattern free of solder mask.



CONTROLLING DIMENSIONS - MILS (0.001")
[METRIC DIM - mm] FOR REFERENCE ONLY

Scale
NOT TO
SCALE

Drawn by
MDLX

Title Modelithics, INC.

File Name IND_AVX_0603_001_datasheet.dwg
Date 02-12-2014 Sheet 1

Rev
1