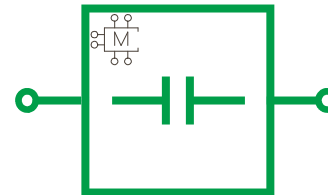


surface mount chip capacitor model

Model Features

- Land pattern (pad) scalable
- Substrate scalable
- Broadband (DC to 65 GHz)
- Equivalent circuit topology
- Accurate effective series resistance
- DC blocking capacitor
- Developed for microstrip interconnects

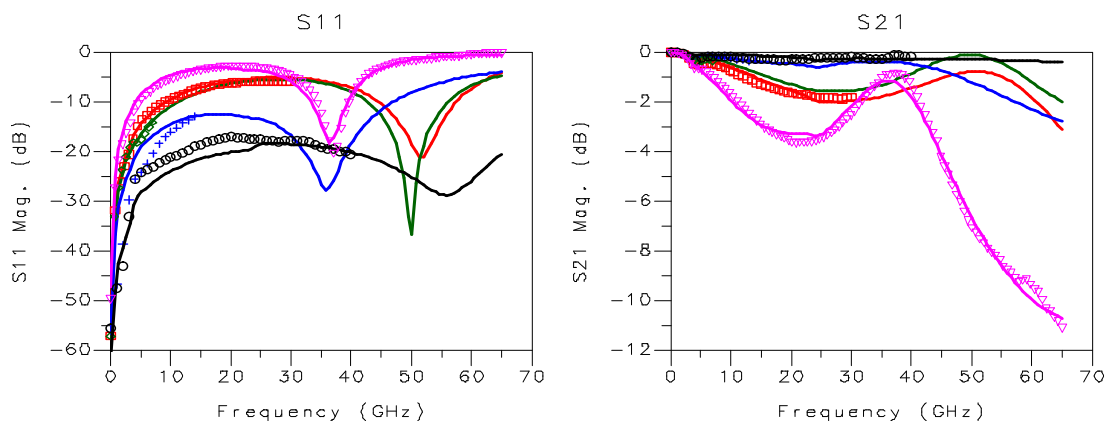


CAP-ATC-545L-001
DC Block
0402 Body Style

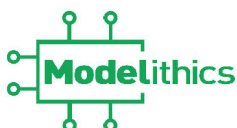
Model Description

CAP-ATC-545L-001 is a substrate scalable model for the ATC 545L (0.1 μF) surface mount chip capacitor. The model is for use with microstrip applications and accounts for substrate (or printed circuit board) related parasitic effects. Substrate height, dielectric constant, loss tangent, interconnect metal thickness, component tolerance, pad width, pad length, and pad gap are model input parameters. Accurate effective series resistance (ESR) is modeled over the frequency range. A Sim_mode switch allows pad stack effects to be disabled. This model has been validated to 65 GHz on a 5 mil Alumina substrate, and to lower frequencies using additional printed circuit board materials (see Technical Notes).

Frequency Sweep



Legend: \square 4mil Rogers 4350B, $+$ 15mil Rogers TMM10, \diamond 60mil Rogers 4003, \circ 10mil Quartz, \blacktriangledown 5mil Alumina, Lines - Model, Symbols - Measured data. Measured data stops at highest valid frequency for each substrate (4 mil - 30 GHz, 15 mil - 12 GHz, 60 mil - 7 GHz, 10 mil (quartz) - 40 GHz, 5mil (Alumina) - 65GHz).



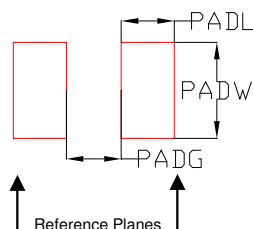
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Technical Notes

- Two-port S-parameters measured using a vector network analyzer and on-board probing with calibration referenced to the outside edges of the component pad stack.
- Capacitors measured in a series microstrip configuration. Models for alternative interconnect configurations (e.g. coplanar waveguide) are available upon request.
- Substrates used to extract the models: 4 mil Rogers 4350B, 15mil Rogers TMM10, 60mil Rogers 4003, 10 mil quartz and 5mil Alumina.
- Typical range of valid substrate types (substrate height H in mils and dielectric constant Er): $0.5 \leq H/Er \leq 16.6$.
- Highest frequency for measurement validation: 7 GHz (60 mil RO4003), 12 GHz (15 mil TMM10), 30 GHz (4 mil RO4350B), 40 GHz (10 mil quartz), 65GHz (5 mil Alumina)
- Additional information about ATC 545L capacitors is available at <http://www.atceramics.com/index.asp>

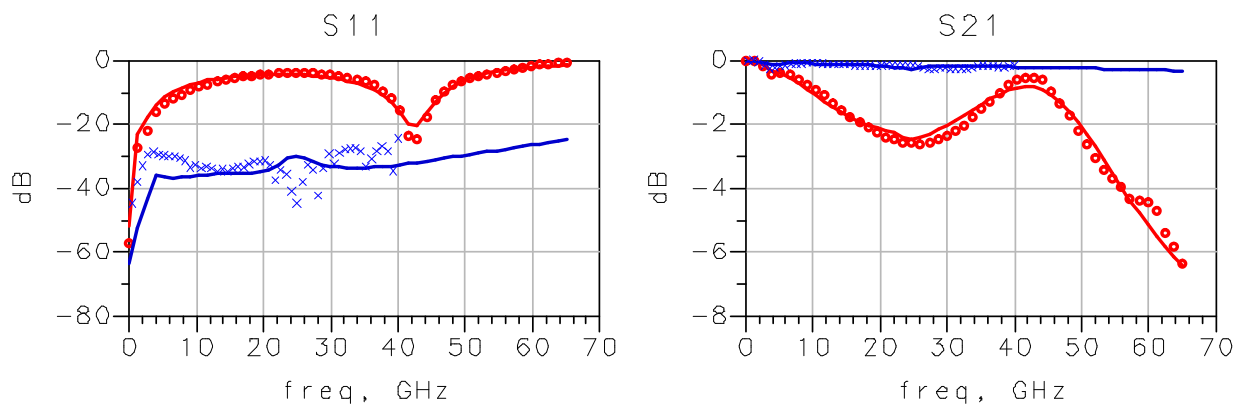
PC Board Footprint



Pad Length: $14 \leq PADL \leq 26$
 Pad Width: $20 \leq PADW \leq 35$
 Pad Gap: $14 \leq PADG \leq 19$

Units in mils

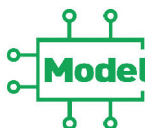
Typical S parameter performance of the model



Legend: ○ - 5mil Alumina, × - 10mil Rogers 4350B
 Line - model performance and symbol - measurement data

Notes:

- 1) Data shown in plots corresponds to the following pad dimensions: PADL = 14.0mil, PADW = 20.0mil, PADG = 16.0mil
- 2) 10mil Rogers 4350 measurement data is supplied by ATC. The pad dimensions used for the measurement: PADL = 8.0mil, PADW = 22.0mil, PADG = 24.0mil

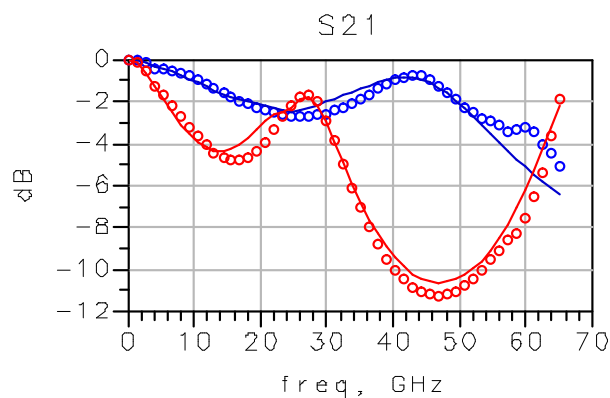
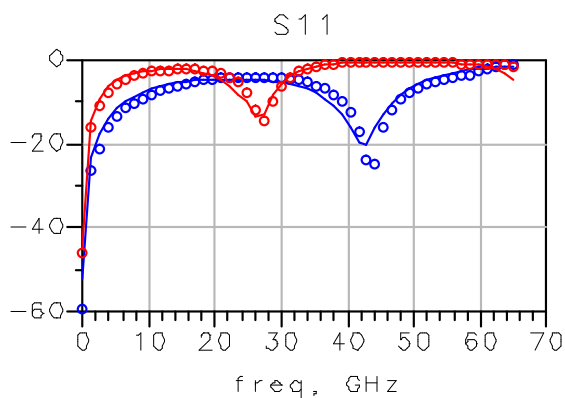


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Performance Comparison using Different Pad Sizes



Legend:

Line - Model performance on 5 mil Alumina

Symbol - Measured data on 5 mil Alumina

Blue - Model performance and measured data shown in plots corresponds to PADL = 14.0mil, PADW = 20.0mil, PADG = 16.0mil

Red - Model performance and measured data shown in plots corresponds to PADL = 25.0mil, PADW = 33.0mil, PADG = 16.0mil

