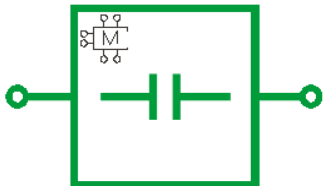
surface mount chip capacitor model

Model Features

- Broadband validation: DC to 65GHz
- Equivalent circuit based
- Substrate scalable: (0.52 ≤H/Er≤ 13.7)
- Land Pattern (Pad) scalable
- Accurate effective series resistance
- Developed for microstrip interconnects



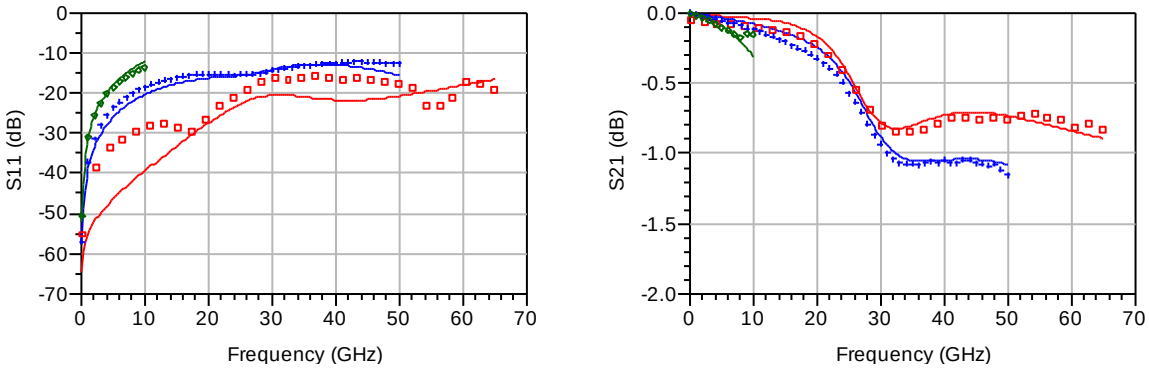
CAP-PPI-01005BB-001
100nF
01005 Body Style

Model Description

The CAP-PPI-01005BB-001 is a substrate scalable Global Model™ for the Passive Plus P/N 01005BB104 surface mount chip capacitor (additional information is available at www.passiveplus.com). This 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.

The pad dimensions used to develop datasheet plots for the model are: length = 0.23 mm, width = 0.23 mm, gap = 0.13 mm.

Frequency Sweep



egend: □ 4mil Rogers 4350B, + 5mil Alumina,◊ 31mil Rogers 5880 , Lines - Model, Symbols - Measured data. Measured data stops at highest valid frequency for each substrate.
S11 (left) and S21 (right) for 100nF capacitor mounted on various substrates from 0.1 to 65 GHz.

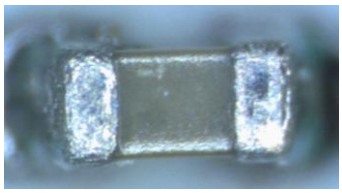
CAP-PPI-01005BB-001

Technical Notes

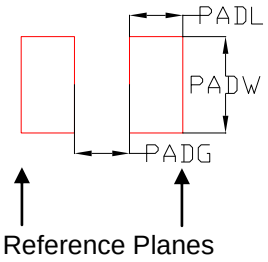
- Two–port S-parameters were measured using a vector network analyzer and on-board probing with calibration referenced to the outside edges of the component pad stack.
- Capacitors were measured in a series microstrip configuration. Models for alternative interconnect configurations (e.g. coplanar waveguide) are available upon request.
- Substrates used to extract the models: 4 mil Rogers 4350B, 5mil Alumina, and 31mil Rogers 5880.
- Typical range of valid substrate types (substrate height H in mils and dielectric constant Er):

  0.52 ≤ H/Er ≤ 13.7.
- Effective series resistance (ESR) was measured and modeled for capacitor.
- Highest frequency for measurement validation: 65GHz (4 mil RO4350B), 50 GHz (5 mil Alumina), and 10 GHz (31 mil RO5880)
- Multiple simulation modes (Sim_mode) are available - full mode, ideal mode and no pad stack.
- Measurements completed in a 50 Ohm system

Device Image



PC Board Footprint



2.76 (0.07) ≤ PADL ≤ 8.27 (0.21)
7.09 (0.18) ≤ PADW ≤ 11.42 (0.29)
5.12 (0.13) ≤ PADG ≤ 11.02 (0.28)

Units in mils (mm)

Model Input Parameters

- 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.
- Pad_mode – 0 for default to Sim_mode, 1 for pads always in layout, 2 for pads never in layout
- Tolerance - Tolerance of the part value. The nominal value for this parameter should be set to 1. Use for statistical distribution.
- Pad_Width - Width of land pattern footprint
- Pad_Length - Length of land pattern footprint
- Pad_Gap – Pad - to - pad spacing (inside pad edge – to – inside pad edge)

Model and Datasheet Revision Notes

10/20/2014 Original model and datasheet development