EE 433 – Fall 2008
Laboratory 2, part 1 Simulation of Passive Components

Introduction to the ADS design Software

Objectives:

- *To introduce the design tool ADS to the student.*
- *To examine the electrical response of real components (with parasitics)*
- *To promote an understanding of the usefulness of microwave simulation.*
- *To foreshadow an impedance matching technique*

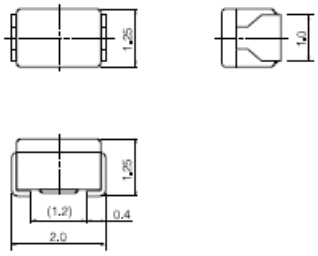
Background/Introduction:

Most of your lab time will be learning the ADS design tool. I recommend you go through the introductory tutorial before beginning. It is often easier to find an existing project that is similar to what you what to model, then save it as a new project you can than modify.

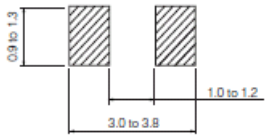
Panasonic Inductors Chip Inductors

■ Type 2012(0805)ND

● Dimensions in mm (not to scale)



● Recommended Land Pattern in mm (not to scale)



■ Standard Packing Quantity
● 3000 pcs./Reel

■ Examples

Part No.	Inductance (nH)	Inductance Tolerance	Q min.	L, Q Test Freq. (MHz)	Q Typical (800 MHz)	SRF*1 (MHz)min.	DCR*2 (Ω)max.	DC Current (mA)max.
ELJND10NKF	10	±10 %	10		72	3300	0.18	540
ELJND12NKF	12				67	3300	0.24	535
ELJND15NKF	15		12		73	3000	0.24	520
ELJND18NKF	18				74	3000	0.29	480

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Panasonic Multilayer Ceramic Capacitors(For General)

Multilayer Ceramic Chip Capacitors (For General Electronic Equipment)

Series: **ECJ**

■ Features

- Small size and wide capacitance range
- Superior humidity characteristics and long life due to the monolithic construction
- Excellent solderability and resistance to soldering heat due to terminals with three layers of silver, nickel and solder
- Low self-inductance and excellent frequency characteristics

■ Recommended Applications

Class 1 (T.C. Type)
Temperature compensations, tuned circuits and filter circuits, where low loss and high stability of capacitance and high insulation resistance are required
Class 2 (HI-K Type)
Coupling and By-pass, where low loss and high stability of capacitance are not so important

■ Explanation of Part Numbers

ECJ Series

1	2	3	4	5	6	7	8	9	10	11	12	
E	C	J	2	V	C	1	H	1	0	1	J	(Example)

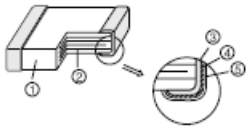
①Product Code
②Size Code
③Packaging Styles
④Temperature Characteristics
⑤Rated Voltage
⑥Nominal Capacitance
⑦Capacitance Tolerance

■ Product Code

ECJ : Multilayer Ceramic Chip Capacitors

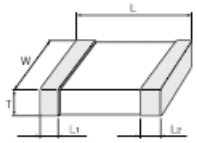
■ Handling Precautions

■ Construction



No	Name
①	Ceramic dielectric
②	Inner electrode
③	Substrate electrode
④	Intermediate electrode
⑤	External electrode

■ Dimensions in mm (not to scale)



Unit : mm

Code	Size Code (EIA)	L	W	T	L1, L2
Z	"06" Type 0201	0.60±0.03	0.30±0.03	0.30±0.03	0.15±0.05
0	"10" Type 0402	1.00±0.05	0.50±0.05	0.50±0.05	0.2±0.1
1	"11" Type 0603	1.6±0.1	0.8±0.1	0.8±0.1	0.3±0.2
2	"12" Type 0805	2.0±0.1	1.25±0.10	0.6±0.1 0.85±0.10 1.25±0.10	0.50±0.25
3	"13" Type 1206	3.20±0.15	1.60±0.15	0.6±0.1 0.85±0.10 1.15±0.10	0.6±0.3
		3.2±0.2	1.6±0.2	1.6±0.2	
4	"23" Type 1210	3.2±0.3	2.5±0.2	2.0±0.2	0.6±0.3

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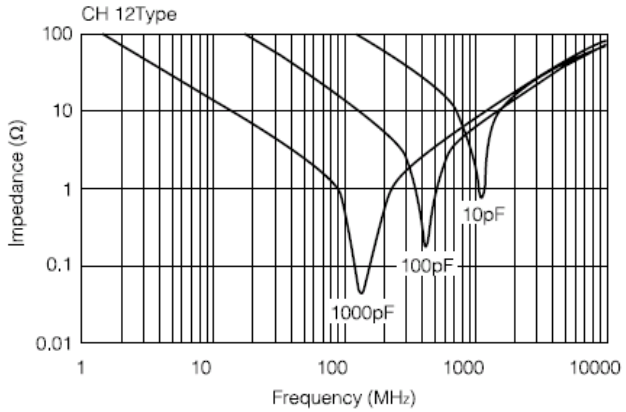
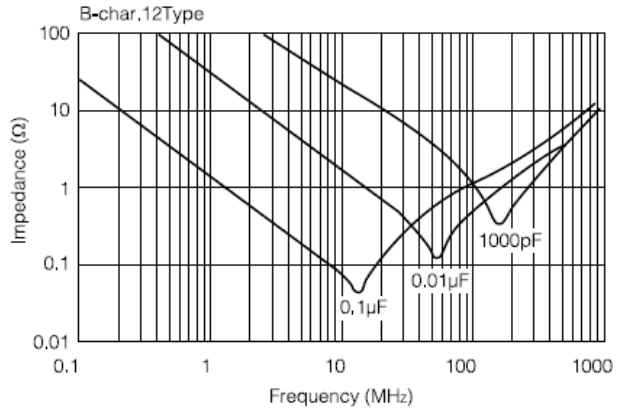
● Impedance-Frequency





Laboratory Procedures

(1) Derive a model for the 10 nH 0805 inductor
(2) Derive a model for the 10 pF capacitor
(3) Setup an ADS project and your models as one ports
(4) Plot the impedance curve of the capacitor and see how close it comes to the above plot. Adjust your model for the best fit. Use a frequency span of 1 MHz to 10 GHz.
(5) What value of "ideal" capacitor would you use for the impedance of the "real" capacitor at 800 MHz? This is called the capacitance multiplication effect.
(6) Plot the real inductor and an ideal 10 nH inductor on the smith chart. Explain what you are seeing.
(7) Plot the real capacitor and an ideal capacitor on the smith chart. Explain what you are seeing.
(8) Create a new circuit consisting of your real capacitor model in series with a Tline of Zo=50 ohms, L= 90degrees at 1 GHz. Plot the impedance curve as you did in part 2.

Data Analysis and Reporting

Write a summary report as you did for the first lab.