

Product Description for the Matching Network Designer in Excel©

This is a screen shot of the spreadsheet:

Z-Load

50.00 + j 0.00 Ω

Load Params		f _{ref} = 0.400 GHz	Z _{ref} = 50.00 Ohm
series	parallel		reflection
R _s [Ω]	R _p [Ω]	50.00	Re [Γ] = 0.00
X _s [Ω]	X _p [Ω]	0.00	Im [Γ] = 0.00
C _s [pF]	C _p [pF]	0.00	Γ = 0.00
L _s [nH]	L _p [nH]	0.00	Θ = +0.00°

Notes:

Owner:
Manfred Kanther

Matching Network Designer

Match 1

fo = 0.400 GHz Step 0,01

1. L p 17.900 nH Step 1

D = -1.112 (Siemens)

2. C s 16.060 pF Step 0,1

X = -0.495 (Ohm)

3. C p 19.780 pF Step 0,1

D = +2.495 (Siemens)

4. L s 4.410 nH Step 0,1

X = +0.222 (Ohm)

5. L p nH Step 1

D = 0.000 (Siemens)

6. T mm Step 1

seff = 1

Θ = +0.000°

7. C p pF Step 0,1

D = +0.000 (Siemens)

8. O 0.000 mm Step 1

D = +0.000 Siemens

9. L s nH Step 0,1

X = +0.000 (Ohm)

10. X p 0.000 Ω Step 1

D = 0.000 (Siemens)

Z-Source

10.00 + j 0.00 Ω

Source Params		f _{ref} = 0.400 GHz	Z _{ref} = 50.00 Ohm
series	parallel		reflection
R _s [Ω]	R _p [Ω]	10.00	Re [Γ] = -0.67
X _s [Ω]	X _p [Ω]	0.00	Im [Γ] = 0.00
C _s [pF]	C _p [pF]	0.00	Γ = 0.67
L _s [nH]	L _p [nH]	0.00	Θ = +180.00°

Wave Relation

Γ = 0.666 / Θ = -179.90°

Z_{in} = 10.04 - j 0.04 [Ohm]

Y_{in} = 0.0996 + j 0.0004 [Siemens]

R_s[Ω] 10.04 R_p[Ω] 10.04

X_s[Ω] 0.04 X_p[Ω] 2.579,17

C_s[pF] 9382,38 C_p[pF] 0,17

Return Loss vs Frequency [GHz]

Delta fo: +/- 25.00 %

Microstrip Impedance Calculator

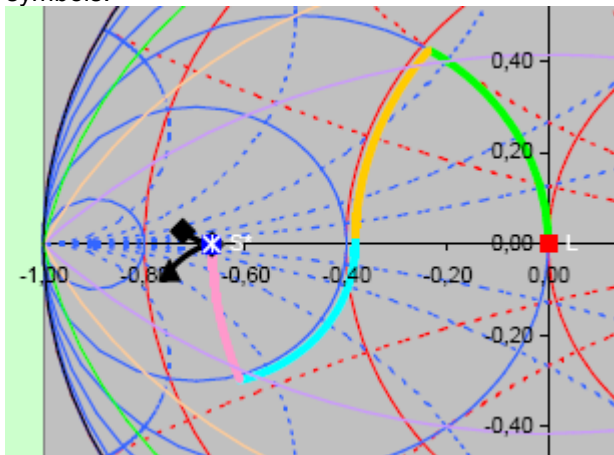
W [mm]	H [mm]	sr	t [mm]	Z ₀ [Ohm]	seff
50	28,4	4,5	1,4	51,05	3,38

thickness

High Width sr

Resonant Frequency	Power vs Voltage Conversion	Own Calculations
f _r [GHz]	Resistor [Ω]	
1,011	50,00	
	P [mW]	
	1,000000	
	P [dBm/W]	
	0,00	
	V [mV]	
	223,608796	
	V [dBmV]	
	46,99	

The complex load and complex source impedance can be set directly. With the design of the matching circuit, by means of constructing an impedance trace from the Complex Load to the Complex Conjugate of the Source, the perfect match can be found. The Complex Load and the Complex Conjugate of the Source is marked in the Chart by red (L) and blue (S*) symbols.



(Detailed view of the spreadsheet)

Below is a detail of how the Load Impedance can be set. Each yellow cell in the setup table accept input data. After input of one parameter, say Gamma or Lp or Cs or Xs etc. the other parameters in the table are re-calculated by the known conversion rules. This makes it easy to take the data directly from a given datasheet.

(The table can also by used as a conversion calculator)

Z-Load

50,00 + j 0,00 Ω

Γ_L

Load Parm's		fref =	0,400 GHz	Zref =	50,00 Ohm
		serial	parallel	reflection	
Rs[Ω]:	50,00	Rp[Ω]:	50,00	Re [Γ] =	0,00
Xs[Ω]:	+ 0,00	Xp[Ω]:	#####	Im [Γ] =	0,00
Cs[pF]:		Cp[pF]:		Γ =	0,00
Ls[nH]:	0,00	Lp[nH]:	#####	Θ =	+ 0,00°

Step

fo = 0,400 GHz . 0,01

Step

1 L p 17,900 nH + - 1

b= -1,112 (Siemens)

Step

(Detailed view of the spreadsheet)

The same is true for Source settings:

Z-Source

10,00 + j 0,00 Ω

Γ_s

Source Parm's		fref =	0,400 GHz	Zref =	50,00 Ohm
		serial	parallel	reflection	
Rs[Ω]:	10,00	Rp[Ω]:	10,00	Re [Γ] =	-0,67
Xs[Ω]:	+ 0,00	Xp[Ω]:	#####	Im [Γ] =	0,00
Cs[pF]:		Cp[pF]:		Γ =	0,67
Ls[nH]:	0,00	Lp[nH]:	#####	Θ =	+ 180,00°

Cs[pF]: 9382,38 Cp[pF]: 0,17

forward backward

(Detailed view of the spreadsheet)

The network design is made by parallel (p) and/or serial (s) component arrangements of Inductor (L), Resistor (R), Capacitor (C), Transmission Line (T), Open Stub (O) and Shorted Stub (S).

Also the input of Reaktance (X) is possible.

The data inputs are fail save and hints are given for correct entering.

The spreadsheet shows a circuit diagram on the left and a list of components on the right. The components are:

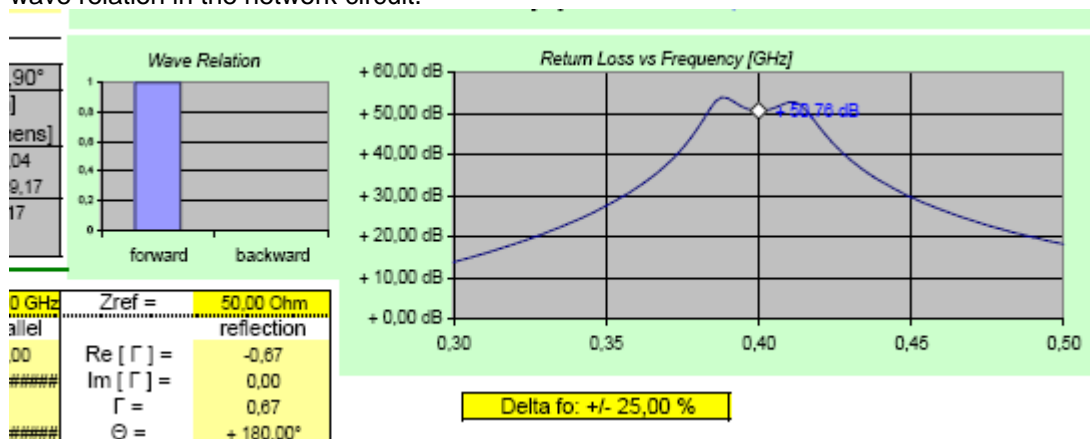
- 1. Inductor (L p) 17,900 nH, b = -1,112 (Siemens)
- 2. Capacitor (C s) 16,060 pF, x = -0,495 (Ohm)
- 3. Capacitor (C p) 19,780 pF, b = +2,488 (Siemens)
- 4. Inductor (L s) 4,410 nH, x = +0,222 (Ohm)
- 5. Inductor (L p) [empty] nH, b = ##### (Siemens)
- 6. Transmission Line (T) 0,000 mm, $\epsilon_{eff} = 1$, $\Theta = +0,000^\circ$
- 7. Capacitor (C p) [empty] pF, b = +0,000 (Siemens)
- 8. Open Stub (O) 0,000 mm, $\epsilon_{eff} = 1$, b = +0,000 Siemens
- 9. Inductor (L s) [empty] nH, x = +0,000 (Ohm)
- 10. Reaktance (X p) 0,000 Ω , b = ##### (Siemens)

Summary parameters:

- $Z_0 = 50,0$ Ohm
- $\Gamma = 0,666 / \Theta = -179,90^\circ$
- $Z_{in} = 10,04 - j 0,04$ [Ohm]
- $Y_{in} = 0,0996 + j 0,0004$ [Siemens]
- $R_s[\Omega]: 10,04$ $R_p[\Omega]: 10,04$
- $X_s[\Omega]: 0,04$ $X_p[\Omega]: 2,379,17$
- $C_s[pF]: 9382,38$ $C_p[pF]: 0,17$

(Detailed view of the spreadsheet)

Two diagrams have been added. One shows the frequency response of the Return Loss (RL) (in this case a wideband matching example), the other is more a nice indication of the wave relation in the network circuit.



(Detailed view of the spreadsheet)

Finally, some calculators are available:

Calculators	Microstrip Impedance Calculator						Resonant Frequency	Power vs Voltage Conversion		Own Calculations
	W [mm]	H [mm]	er	t [mm]	Zo [Ohm]	seff		fr [GHz]	Resistor [Ω]	
	50	28,4	4,5	1,4	51,05	3,38	1,011	50,00		
							P [mW]	1,000000		
							L [nH]	0,00		
							P [dbmW]	223,606768		
							V [mV]	46,69		
							C [pF]			
							V [dBmV]			

(Detailed view of the spreadsheet)