

Design a microstrip ring hybrid for a $40\ \Omega$ system with a design frequency of 3 GHz on Rogers RO4003C, 1 oz. copper, 0.032" board thickness. Also, draw labeled sketch of design.

Use 'DK values for a specific frequency' option w/ MWI.

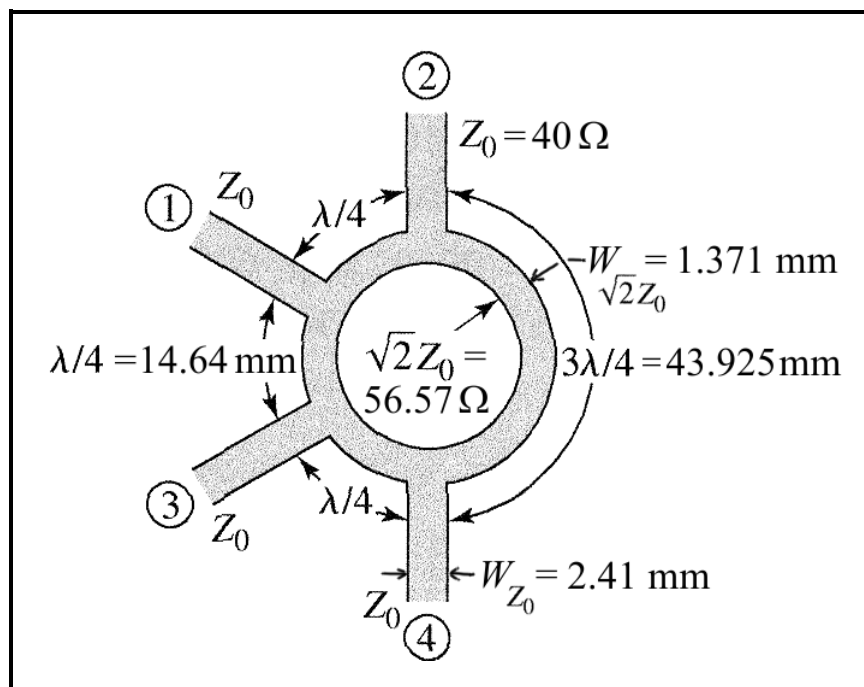
For $Z_0 = 40\ \Omega$, $W_{40} = 2.41\ \text{mm}$

For $\sqrt{2}Z_0 \approx 56.57\ \Omega$, $W_{56.6} = 1.3708\ \text{mm}$

$$V_p = 1.757 \times 10^8\ \text{m/s}$$

$$\lambda = \frac{V_p}{f} = \frac{1.757 \times 10^8}{3 \times 10^9} = 58.56\ \text{mm}$$

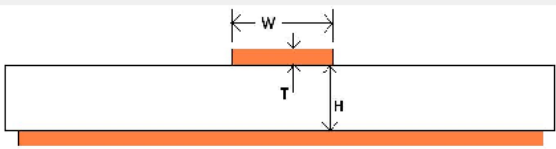
$\lambda/4 = 14.642\ \text{mm}$ & $3\lambda/4 = 43.925\ \text{mm}$



40 Ω case

MWI 2018

Program Design Type Information



Microstrip

Transmission Line Information

Conventional Microstrip
Using 0.812 mm RO4003C circuit materials.
Conductor width = 2.41 mm

Impedance = 40.00 ohms
Effective dk = 3.0700

Dielectric Loss is = 1.17654 dB/m
Conductor loss is = 1.25047 dB/m
Total loss is = 2.42702 dB/m

Dielectric Q Factor is 406.6
Conductor Q Factor is 536.2
Total Q Factor for transmission line is 231.2

Wavelength on transmission line:
1 wavelength = 0.057 meters
1/2 wavelength = 0.028 meters
1/4 wavelength = 0.014 meters
1/8 wavelength = 0.007 meters

☒ Display results of only one calculation

All material names are licensed, registered trademarks of Rogers Corporation

Material Name	Bulk Dk	Df	TC Dk	Therm Co
TMM13i	12.2	0.0019	-43	0.76
ULTRALAM ...	3.1	0.0024	100	0.2
RO3003	3	0.001	13	0.5
RO3006	6.5	0.002	-160	0.72
RO3010	11.2	0.0023	-280	0.95
RO3035	3.6	0.0018	-34	0.5
RO3203	3.02	0.0016	13	0.5
RO3206	6.6	0.0027	-212	0.63
RO3210	10.8	0.0027	-459	0.81
RO4003C	3.55	0.0027	40	0.64
RO4003C Lo...	3.5	0.0027	40	0.64

Material Properties

Material: RO4003C Thickness (H): 0.812 mm

Dk: 3.851 Df: 0.0027 Thermal Cond.: 0.64 W/K*m

☐ use z-axis Bulk Dk values
☒ Dk values for a specific frequency
☐ Dk values for characteristic Impedance

Conductor Parameters

Thickness (T): 33.02 microns Surface Area Index: 3.9

1oz ED Conductivity: 5.813×10^{-7} S/m Avg Nodule Size (microns): 0.28

Surface Roughness (RMS): 3.4 microns

Roughness loss model: Hall-Huray

Copper roughness values:
☒ Optimum for accuracy
☐ Actual measurement

Calculate Frequency: 3 GHz

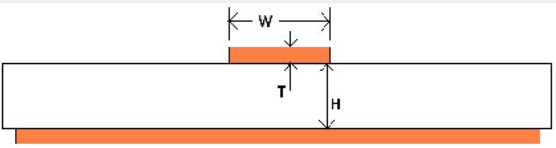
Generate Tables and Files: None

Freq. Range: 1 to 30 GHz

56.57 Ω case

MWI 2018

Program Design Type Information



Microstrip

Transmission Line Information

Conventional Microstrip
Using 0.812 mm RO4003C circuit materials.
Conductor width = 1.3708 mm

Impedance = 56.57 ohms
Effective dk = 2.9122

Dielectric Loss is = 1.11590 dB/m
Conductor loss is = 1.39786 dB/m
Total loss is = 2.51377 dB/m

Dielectric Q Factor is 417.5
Conductor Q Factor is 467.2
Total Q Factor for transmission line is 220.5

Wavelength on transmission line:
1 wavelength = 0.058 meters
1/2 wavelength = 0.029 meters
1/4 wavelength = 0.014 meters
1/8 wavelength = 0.007 meters

☒ Display results of only one calculation

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RO3206	6.6	0.0027	-212	0.63
RO3210	10.8	0.0027	-459	0.81
RO4003C	3.55	0.0027	40	0.64
RO4003C Lo...	3.5	0.0027	40	0.64

Material Properties

Material: RO4003C Thickness (H): 0.812 mm

Dk: 3.851 Df: 0.0027 Thermal Cond.: 0.64 W/K*m

☐ use z-axis Bulk Dk values
☒ Dk values for a specific frequency
☐ Dk values for characteristic Impedance

Conductor Parameters

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Surface Roughness (RMS): 3.4 microns

Roughness loss model: Hall-Huray

Copper roughness values:
☒ Optimum for accuracy
☐ Actual measurement

Calculate Frequency: 3 GHz

Generate Tables and Files: None

Freq. Range: 1 to 30 GHz