

MWI-2018 Software Instruction Manual



Helping **power, protect, connect** our world™

MWI-2018 Software Instruction Manual

- Installing software
- Starting software and basic operations
- Detailed software capabilities

MWI-2018 Software Instruction Manual

Installing:

- After downloading the mwi2018.exe file, save it on the hard drive of the computer that will be using the software
 - Do not install on a network system
 - If not able to download the *.exe file, there is an option to download the same file that is in a zip format
- Double click on the "mwi2018.exe"
- The computer that runs the software must have an operating system with the dot-net framework, from 2004 or more recent

MWI-2018 Software Instruction Manual

Software Operations, material list

Dielectric Constant
"Design Dk"

Dissipation Factor

Thermal Coefficient of Dk

Thermal conductivity of the substrate

When floating the mouse over the material name, additional information will be shown.

The screenshot displays the MWI-2018 software interface. On the left, a diagram of a microstrip is shown with dimensions w , T , and H . Below it is the 'Transmission Line Information' section. The main area features a material list table with columns for Material Name, Bulk Dk, Df, TC Dk, and Them Con. A tooltip is visible over the material 'RT/duroid 6035HTC', providing details such as 'Moisture absorption = 0.06 %' and 'Coefficient of Thermal Expansion = 39 ppm/C in Z-axis'. Below the table are sections for 'Material Properties' (Material: RO4350B, Thickness: 0.020 in., Dk: 3.66, Df: 0.0037, Thermal Cond.: 0.62 W/K*m) and 'Conductor Parameters' (Thickness: 0.0006 in., Surface Area Index: 3.8, Conductivity: 5.813×10^7 S/m, Avg Nodule Size: 0.28 microns, Surface Roughness: 2.8 microns). At the bottom, there are options for 'Analytical', 'Synthesis Width', and 'Synthesis Space', along with a 'Calculate' button and frequency settings (1 GHz to 30 GHz).

Material Name	Bulk Dk	Df	TC Dk	Them Con
RT/duroid 5870	2.33	0.0012	-115	0.22
RT/duroid 5880	2.2	0.0009	-125	0.2
RT/duroid 5880LZ	1.96	0.0019	22	0.2
RT/duroid 6002	2.94	0.0012	12	0.6
RT/duroid 6010LM	10.7	0.0023	-425	0.78
RT/duroid 6035HTC	3.6	0.0013	-66	1.44
RT/duroid 6202	2.94	0.0015	12	0.68
TMM3				
TMM4				
TMM6				
TMM10	9.8	0.0022	-38	0.76
TMM10s	9.9	0.002	42	0.76

MWI-2018 Software Instruction Manual

Software Operations, material thickness

Only standard thicknesses of the selected material are shown. This can be overridden.

The screenshot displays the MWI-2018 software interface. On the left, a diagram of a microstrip is shown with dimensions w (width), T (thickness), and H (height). Below the diagram is the label "Microstrip".

The main window contains a "Material Properties" section with a table of material names and their properties. The table is as follows:

Material Name	Bulk Dk	Df	TC Dk	Therm Con
RT/duroid 5870	2.33	0.0012	-15	0.22
RT/duroid 5880	2.2	0.0009	-125	0.2
RT/duroid 5880LZ	1.96	0.0019	22	0.2
RT/duroid 6002	2.94	0.0012	12	0.6
RT/duroid 6010LM	10.7	0.0023	-425	0.78
RT/duroid 6035HTC	3.6	0.0013	-66	1.44
RT/duroid 6202	2.94	0.0015	13	0.68
TMM3	3.45	0.002	37	0.7
TMM4	4.7	0.002	-15.3	0.7
TMM6	6.3	0.0023	-11	0.72
TMM10	9.8	0.0022	-38	0.76
TMM15	9.8	0.002	42	0.76

Below the table, the "Material Properties" section shows the selected material "RO4350B" with a thickness of 0.020 in. The "Conductor Parameters" section shows a thickness of 0.0006 in. and a surface roughness of 2.8 microns. The "Circuit Parameters" section shows a conductor width of 0.043 in. and a space of 0.009 in. with a length of 1 in.

The bottom of the interface includes a "Calculate" button and a "Frequency" dropdown set to 1 GHz. A checkbox for "Display results of only one calculation" is checked.

MWI-2018 Software Instruction Manual

Software Operations, copper definition

When copper is selected only standard thicknesses and copper types of the selected material are shown. This can be overridden.

The screenshot displays the MWI-2018 software interface. At the top left, a diagram of a microstrip is shown with dimensions labeled: w (width), T (thickness), and H (height). Below the diagram is the label "Microstrip".

The main interface is divided into several sections:

- Material Properties:** Shows the selected material as "RO4350B" with a thickness of "0.020 in.". It lists properties: Dk = 3.66, Df = 0.0037, Thermal Cond. = 0.62 W/Km. There are radio buttons for "use z-axis Bulk Dk values" (selected), "Dk values for a specific frequency", and "Dk values for characteristic impedance".
- Conductor Parameters:** Shows "Thickness (T)" as "0.0006 in.", "Conductivity" as "5.813 X 10⁷ S/m", and "Surface Roughness (RMS)" as "2.8 microns". There are also fields for "Surface Area Index" (3.8), "Avg Nodule Size (microns)", and "Copper roughness values" (Optimum for accuracy selected).
- Material List:** A table of materials is visible, including RT/duroid 5870, RT/duroid 5880, RT/duroid 5880LZ, RT/duroid 6002, RT/duroid 6010LM, RT/duroid 6035HTC, RT/duroid 6202, TMM3, TMM4, TMM6, TMM10, and TMM10L.
- Calculation Settings:** Includes "Analytical" (selected), "Synthesis Width", "Synthesis Space", "Impedance" (50 Ohms), "Frequency" (1 GHz), and "Generate Tables and Files" (None).

Green arrows point from the text on the right to the "Conductor Parameters" section, specifically to the "Thickness (T)" and "Conductivity" fields.

Conductor conductivity can be entered; however it will affect all conductor layers of the circuit

MWI-2018 Software Instruction Manual

Software Operations, copper definition

There are two copper roughness models available, which will supplement the insertion loss calculations with increased conductor loss due to copper surface roughness.

The Morgan rule is most accurate when used below about 12 GHz

The Hall-Huray model is most accurate at higher frequencies

The surface roughness (RMS) is used for Morgan rule only

The screenshot displays the MWI-2018 software interface. On the left, a diagram of a microstrip is shown with dimensions W (width), T (thickness), and H (height). The main window is divided into several sections:

- Material Properties:** Material: RO4350B, Thickness (H): 0.020 in., Dk: 3.66, Df: 0.0037, Thermal Cond.: 0.62 W/K/m.
- Conductor Parameters:** Thickness (T): 0.0006 in., 1/2oz ED, Conductivity: 5.813×10^{17} S/m, Surface Roughness (RMS): 2.8 microns.
- Roughness loss model:** Hall-Huray, Copper roughness values: Optimum for accuracy.
- Frequency:** 1 GHz.

A green box highlights the roughness loss model and copper roughness values settings. A callout box labeled "Copper roughness information" points to this area.

Copper roughness information

MWI-2018 Software Instruction Manual

Software Operations, changing materials

The screenshot displays the MWI-2018 software interface. On the left, a diagram of a microstrip is shown with dimensions W (width), T (thickness), and H (height). Below it, the 'Transmission Line Information' section is visible. The main area features a material selection table and various parameter settings.

Material Name	Bulk Dk	Df	TC Dk	Therm Con
RT/duroid 5870	2.33	0.0012	-115	0.22
RT/duroid 5880	2.2	0.0009	-125	0.2
RT/duroid 5880LZ	1.96	0.0019	22	0.2
RT/duroid 6002	2.94	0.0012	12	0.6
RT/duroid 6010LM	10.7	0.0023	-425	0.78
RT/duroid 6035HTC	3.6	0.0013	-66	1.44
RT/duroid 6202	2.94	0.0015	13	0.68
TMM3	3.45	0.002	37	0.7
TMM4	4.7	0.002	-15.3	0.7
TMM6	6.3	0.0023	-11	0.72
TMM10	9.8	0.0022	-38	0.76

Material Properties for RO4350B:

- Material: RO4350B
- Thickness (H): 0.020 in.
- Dk: 3.66
- Df: 0.0037
- Thermal Cond.: 0.62 W/Km

Conductor Parameters:

- Thickness (T): 0.0006 in.
- Conductivity: 5.813×10^{-7} S/m
- Surface Roughness (RMS): 2.8 microns

Circuit Parameters:

- Conductor Width (W): 0.043 in.
- Space (S): 0.009 in.
- Length: 1 in.

Additional settings include 'Material Properties' (Material: RO4350B, Thickness: 0.020 in., Dk: 3.66, Df: 0.0037, Thermal Cond.: 0.62 W/Km), 'Conductor Parameters' (Thickness: 0.0006 in., Conductivity: 5.813×10^{-7} S/m, Surface Roughness: 2.8 microns), and 'Circuit Parameters' (Conductor Width: 0.043 in., Space: 0.009 in., Length: 1 in.). The interface also includes a 'Calculate' button, a 'Frequency' field set to 1 GHz, and a 'Freq. Range' field set to 1 to 30 GHz.

When changing from one material to another, the nearest standard thickness of new material selected will be chosen.

The optimum copper type will be automatically selected, for the newly selected material.

Both of these can be overridden.

MWI-2018 Software Instruction Manual

Software Operations, Design Dk values

Design Dk is built into this software

For simple calculations the default z-axis Bulk Dk can be used

More accurate results can be achieved by using the RF Design Dk or Digital Dk Values

The screenshot displays the MWI-2018 software interface. On the left, a diagram of a microstrip is shown with dimensions W (width), T (thickness), and H (height). Below it, the 'Transmission Line Information' section is visible. The main window contains a material selection table, a 'Material Properties' section, and a 'Conductor Parameters' section. A green box highlights the 'Material Properties' section, specifically the 'Dk' and 'Df' values for material RO4350B, and the radio button options for selecting Dk values.

Material Name	Bulk Dk	Df	TC Dk	Them Con
RT/duroid 5870	2.33	0.0012	-115	0.22
RT/duroid 5880	2.2	0.0009	-125	0.2
RT/duroid 5880LZ	1.96	0.0019	22	0.2
RT/duroid 6002	2.94	0.0012	12	0.6
RT/duroid 6010LM	10.7	0.0023	-425	0.78
RT/duroid 6035HTC	3.6	0.0013	-66	1.44
RT/duroid 6202	2.94	0.0015	13	0.68
TMM3	3.45	0.002	37	0.7
TMM4	4.7	0.002	-15.3	0.7
TMM6	6.3	0.0023	-11	0.72
TMM10	9.8	0.0022	-38	0.76
TMM10	9.9	0.002	42	0.76

Material Properties

Material: RO4350B Thickness (H): 0.020 in.

Dk	Df	Thermal Cond.
3.66	0.0037	0.62 W/K ² m

use z-axis Bulk Dk values
 Dk values for a specific frequency
 Dk values for characteristic impedance

Conductor Parameters

Thickness (T): 0.0006 in.
1/2oz ED
Conductivity: 5.817×10^{-7} S/m
Surface Roughness (RMS): 2.8 microns

Surface Area Index: 3.8
Roughness loss model: Hall-Hurray
Avg Nodule Size (microns): 0.28
Copper roughness values: Optimum for accuracy, Actual measurement

Calculate Frequency: 1 GHz Freq. Range: 1 to 30 GHz

MWI-2018 Software Instruction Manual

Software Operations, Design Dk values

The screenshot displays the MWI-2018 software interface. On the left, a diagram of a microstrip is shown with dimensions W (width), T (thickness), and H (height). The main window contains a material selection table, material properties, and conductor parameters.

Material Name	Bulk Dk	Df	TC Dk	Therm Con
RT/duroid 5870	2.33	0.0012	-115	0.22
RT/duroid 5880	2.2	0.0009	-125	0.2
RT/duroid 5880LZ	1.96	0.0019	22	0.2
RT/duroid 6002	2.94	0.0012	12	0.6
RT/duroid 6010LM	10.7	0.0023	-425	0.78
RT/duroid 6035HTC	3.6	0.0013	-66	1.44
RT/duroid 6202	2.94	0.0015	13	0.68
TMM3	3.45	0.002	37	0.7
TMM4	4.7	0.002	-15.3	0.7
TMM6	6.3	0.0023	-11	0.72
TMM10	9.8	0.0022	-38	0.76
TMM15	9.9	0.002	42	0.76

Material Properties for RO4350B:

Material	Thickness (H)	Dk	Df	Thermal Cond.
RO4350B	0.020 in.	3.66	0.0037	0.62 W/K*m

Conductor Parameters:

Thickness (T)	Conductivity	Surface Roughness (RMS)
0.0006 in.	5.812×10^{17} S/m	2.8 microns

Design Dk selection options:

- use z-axis Bulk Dk values
- Dk values for a specific frequency
- Dk values for characteristic impedance

Frequency: 1 GHz

Design Dk is built into this software

For RF applications at a specific frequency or narrow frequency range, then the RF Design Dk values can be used.

Example: When designing a filter at 3 GHz the Design Dk “Dk values for a specific frequency” should be used and the Frequency input set to 3

MWI-2018 Software Instruction Manual

Software Operations, Design Dk values

Design Dk is built into this software

The screenshot displays the MWI-2018 software interface. On the left, a diagram of a microstrip is shown with dimensions W (width), T (thickness), and H (height). The main window is divided into several sections:

- Material Properties:** Shows material **RO4350B** with $Dk = 3.739$, $Df = 0.0037$, and Thermal Cond. $0.62 \text{ W/K}^{\circ}\text{m}$.
- Conductor Parameters:** Shows **Thickness (T) = 0.0006 in**, **Conductivity = $5.813 \times 10^7 \text{ S/m}$** , and **Surface Roughness (RMS) = 2.8 microns**.
- Material Selection Table:** A table listing various materials with their Bulk Dk, Df, TC Dk, and Them Con values.
- Design Options:** Includes radio buttons for **use z-axis Bulk Dk values**, **Dk values for a specific frequency**, and **Dk values for characteristic impedance** (which is selected).
- Calculation Settings:** Includes **Analytical** selected, **Impedance = 50 Ohms**, **Frequency = 3 GHz**, and **Generate Tables and Files = None**.

A green box highlights the "Dk values for characteristic impedance" option in the Design Options section.

Typically the user will use Digital Design Dk values for characteristic impedance, such as PCB fabricators trying to achieve a controlled impedance for a circuit.

Also this option is good for high speed digital applications or very wideband RF applications

MWI-2018 Software Instruction Manual

Software Operations, Analytical and Synthesis

Units can be changed between English and Metric

User can select to generate a table or file of information for a range of frequencies.

For some circuit geometries and/or designs, the synthesis may be unstable.

Using the Analytical option is safer and gives much more information.

User can do a simple Synthesis, then click to Analytical and it will hold the same data and give much more information when the calculate button is pressed.

The screenshot displays the MWI-2018 software interface. At the top left, a diagram of a microstrip is shown with dimensions W (width), T (thickness), and H (height). Below the diagram is the label "Microstrip".

The main window contains several panels:

- Material Selection Table:** A table listing various materials with their properties. The table has columns for Material Name, Bulk Dk, Df, TC Dk, and Them Con.
- Material Properties:** A section for selecting a material (e.g., RO4350B) and defining its properties like Thickness (H), Dk, Df, and Thermal Cond.
- Conductor Parameters:** A section for defining conductor properties like Thickness (T), Conductivity, Surface Roughness (RMS), and Surface Area Index.
- Calculation Options:** Radio buttons for "Analytical", "Synthesis Width", and "Synthesis Space". A "Calculate" button is present.
- Frequency and Output:** A "Frequency" input field (set to 3 GHz) and a "Generate Tables and Files" dropdown menu with options like "None", "Table, Loss vs. Freq", and "File, Loss vs. Freq".

Arrows from the surrounding text point to the "English/Metric" selection, the "Generate Tables and Files" dropdown, and the "Analytical" radio button.

Synthesis will generate the conductor width or spacing, given an impedance target.

Analytical will solve for impedance and other electrical properties given circuit geometry.

MWI-2018 Software Instruction Manual

Software Operations, Summary window

If this is checked, the text window will clear each time the calculate button is pressed.

If not checked, all of the models ran will accumulate in the text window; with no known limit.

With additional information, the window will default to the top, so the user will need to scroll down to see the most recent information.

The screenshot displays the MWI-2018 software interface. At the top, a diagram of a microstrip is shown with dimensions W (width), T (thickness), and H (height). Below the diagram, the text "Microstrip" is centered. The interface is divided into several sections:

- Transmission Line Information:** Conventional Microstrip, Using 0.020 inch RO4350B circuit materials. Conductor width = 0.043 in. Impedance = 50.19 ohms, Effective $dk = 2.8417$.
- Material Properties:** Material: RO4350B, Thickness (H): 0.020 in. $dk = 3.66$, $df = 0.0037$, Thermal Cond. = 0.62 W/K²m.
- Conductor Parameters:** Thickness (T): 0.0006 in., 1/2oz ED, Conductivity: 5.813×10^{17} S/m, Surface Roughness (RMS): 2.8 microns.
- Material Selection Table:**

Material Name	Bulk Dk	Df	TC Dk	Them Con
RT/duroid 5870	2.33	0.0012	-115	0.22
RT/duroid 5880	2.2	0.0009	-125	0.2
RT/duroid 5880LZ	1.96	0.0019	22	0.2
RT/duroid 6002	2.94	0.0012	12	0.6
RT/duroid 6010LM	10.7	0.0023	-425	0.78
RT/duroid 6035HTC	3.6	0.0013	-66	1.44
RT/duroid 6202	2.94	0.0015	13	0.68
TMM3	3.45	0.002	37	0.7
TMM4	4.7	0.002	-15.3	0.7
TMM6	6.3	0.0023	-11	0.72
TMM10	9.8	0.0022	-38	0.76
TMM10	9.8	0.002	42	0.76
- Conductor Loss Model:** Surface Area Index: 3.8, Roughness loss model: Hall-Huray.
- Quality Factor:** Dielectric Q Factor is 303.0, Conductor Q Factor is 311.9, Total Q Factor for transmission line is 153.7.
- Wavelength:** Wavelength on transmission line: wavelength = 2.333 in., 1/2 wavelength = 1.166 in.
- Options:** use z-axis Bulk Dk values, Dk values for a specific frequency, Dk values for characteristic impedance.
- Buttons:** Analytical (selected), Synthesis Width, Synthesis Space, Impedance: 50 Ohms, Calculate, Frequency: 3 GHz, Generate Tables and Files: None, Freq. Range: 1 to 30 GHz.

MWI-2018 Software Instruction Manual

Software Operations, Summary window

The screenshot displays the MWI-2018 software interface. At the top, there is a menu bar with 'Program', 'Design Type', and 'Information'. Below the menu bar is a diagram of a microstrip line on a substrate, with labels for width (W), thickness (T), and height (H). The diagram is labeled 'Microstrip'.

Below the diagram is the 'Transmission Line Information' section, which contains the following text:

- Conventional Microstrip
- Using 0.020 inch RO4350B circuit materials
- Conductor width = 0.043 in.
- Impedance = 50.19 ohms
- Effective dk = 2.8417
- Dielectric Loss is = 0.0385 dB/in
- Conductor loss is = 0.0521 dB/in
- Total loss is = 0.0907 dB/in
- Dielectric Q Factor is 303.0
- Conductor Q Factor is 311.9
- Total Q Factor for transmission line is 153.7
- Wavelength on transmission line
- 1 wavelength = 2.333 in
- 1/2 wavelength = 1.166 in

At the bottom left of the 'Transmission Line Information' section, there is a checkbox labeled 'Display results of only one calculation' which is checked.

On the right side of the interface, there is a table of material properties and a 'Calculate' button. The table is titled 'All material names are licensed, registered trademarks of Rogers Corporation' and has the following columns: Material Name, Bulk Dk, Df, TC Dk, and Therm Con. The table lists various materials such as RT/duroid 5870, RT/duroid 5880, etc.

Below the table is the 'Material Properties' section, which includes fields for Material (RO4350B), Thickness (H) (0.020 in), Dk (3.66), Df (0.0037), and Thermal Cond. (0.62 W/Km). There are also radio buttons for selecting the calculation method: 'use z-axis Bulk Dk values' (selected), 'Dk values for a specific frequency', and 'Dk values for characteristic Impedance'.

Below the material properties is the 'Conductor Parameters' section, which includes fields for Thickness (T) (0.0006 in), Surface Area Index (3.8), Avg Nodule Size (microns) (0.28), and Surface Roughness (RMS) (2.8 microns). There are also radio buttons for selecting the roughness loss model: 'Hall-Huray' (selected), 'Optimum for accuracy', and 'Actual measurement'.

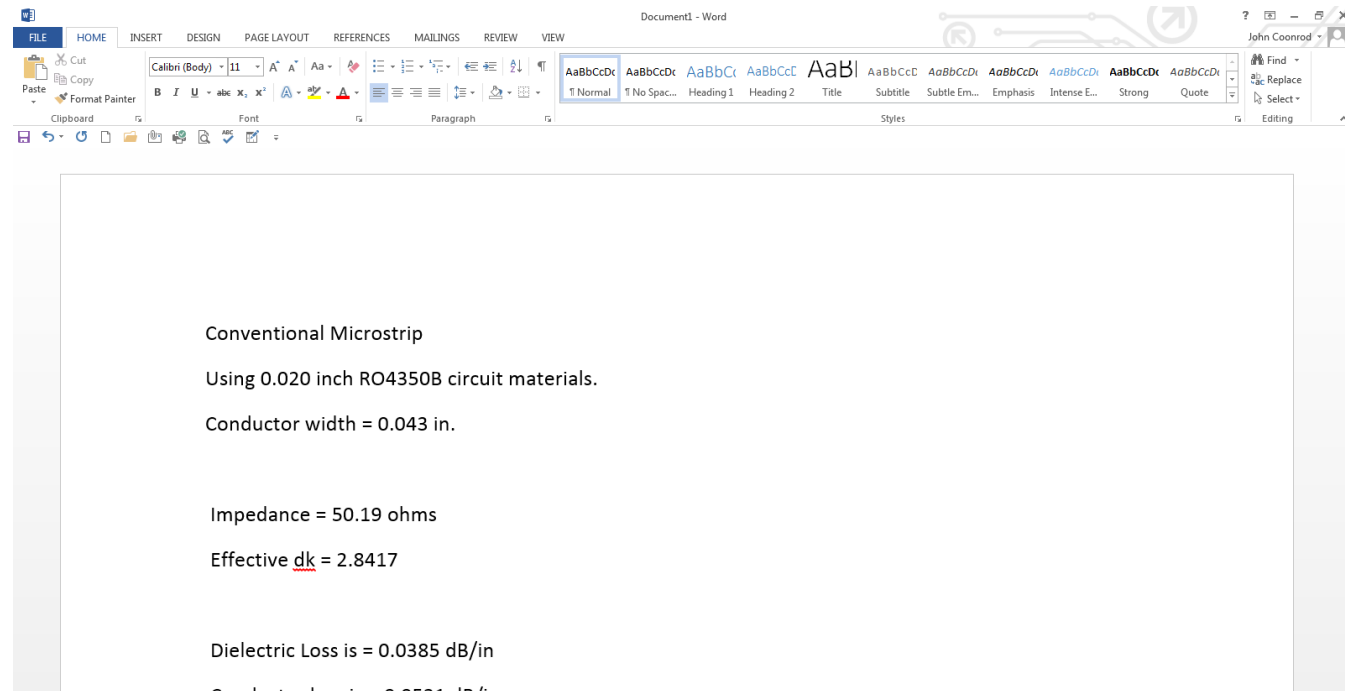
At the bottom right, there is a 'Calculate' button and a 'Generate Tables and Files' section with a dropdown menu set to 'None'. There is also a 'Frequency' field set to 3 GHz and a 'Freq. Range' field set to 1 to 30 GHz.

After pressing the Calculate button, the information can be highlighted and copied into other Windows[®] software such as a word processor.

MWI-2018 Software Instruction Manual

Software Operations, Copy to other programs

Example: copy from
MWI-2018 and
paste into Windows®
Word



MWI-2018 Software Instruction Manual

Software Operations, Generating comma delimited file

A comma delimited file can be generated with a table of information.

A file will be saved in the same directory as the MWI-2018 software and named "mwi2018.txt".

The user can open this file with Excel and follow the prompts for importing the file as a comma delimited file. This will allow the user to manipulate the data and generate graphs.

The screenshot displays the MWI-2018 software interface. A central dialog box titled "File Created" provides instructions: "A temporary file has been created in the same directory as MWI-2018, named mwi2018.txt. This file can be opened in Excel, as a comma delimited file and data separated into cells. In Excel, Open File, change file type to *.txt, click on mwi2018.txt and follow the prompts with delimited option to 'comma'. Please save the new Excel file as a different name with an Excel .xls extension immediately, to avoid conflict if you need to generate another delimited text file." The background software window shows a "Microstrip" design diagram with dimensions W, T, and H. Below the diagram, the "Transmission Line Information" section lists: "Conventional Microstrip Using 0.020 inch RO4350B circuit materials. Conductor width = 0.043 in." It also provides "Impedance = 50.19 ohms" and "Effective dk = 2.8417". The bottom of the window features a "Calculate" button and various parameter settings like "Frequency 3 GHz" and "Impedance 50 Ohms".

MWI-2018 Software Instruction Manual

Software Operations, Generating Charts

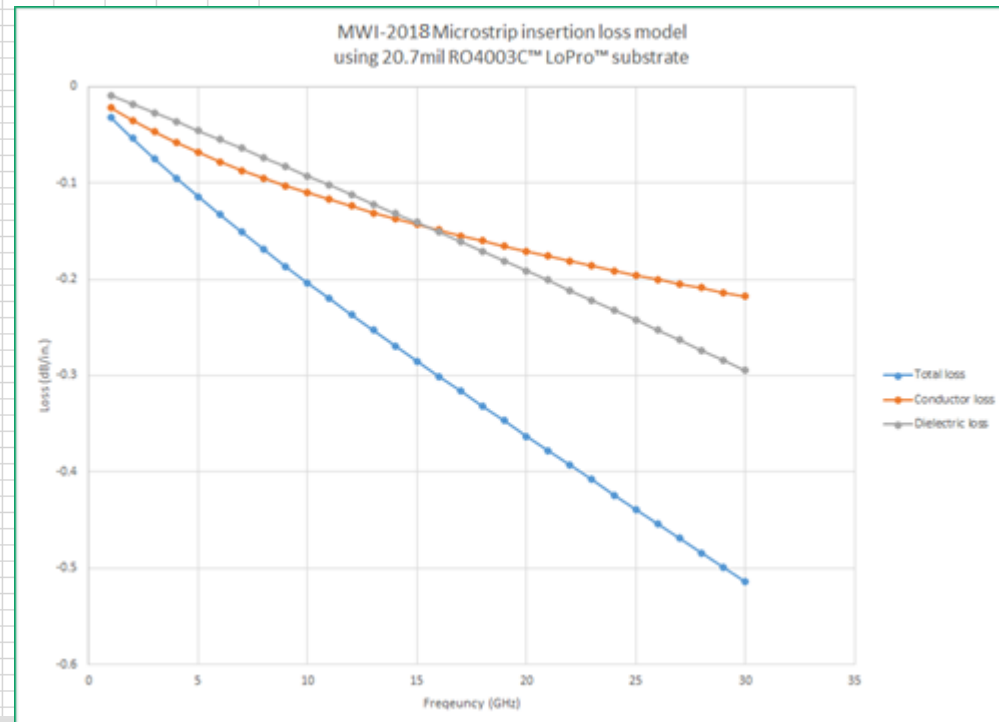
Open Excel® spreadsheet, change file type to "All Files" and open "mwi2018.txt".

Click on delimited, click on Next, click on comma delimited, click Next and Finish.

With the table of information, you can easily generate a graph.

To avoid complications, the user should rename this new Excel file immediately, to something other than "mwi2018.txt" and with the ".xls" extension.

Cell	Text
A1	Convent Microstrip
B1	Using
C1	0.0207 inch
D1	=
E1	RO4003 LoPro
F1	circuit materials.
A2	Conduct width
B2	=
C2	0.046 in.
A5	The immedia following informat is at 0.01 GHz and the
B5	Losses vs. Frequen table is given further below where noted.
A8	Impedan = 49.99 ohms
B8	Effective dk = 2.7305
A11	Dielectri Loss is = 9.1522 dB/in
B11	Conduct loss is = 0.002 dB/in
C11	Total loss is = 0.0021 dB/in
A15	Dielectri Q Factor is 417.4
B15	Conduct Q Factor is 18.77
C15	Total Q Factor for transmis line is 17.96
A19	Wavelen on transmis line:
B19	1 wavelen = 714.2 in.
C19	2-Jan wavelen = 357.1 in.
D19	4-Jan wavelen = 178.5 in.
E19	8-Jan wavelen = 89.28 in.
A25	Open Single End Fringing = 0.0085 inches
B25	Skin depth in copper is = ##### inches
A29	Phase Velocity: 1.81E+08 meters/sec.
B29	##### in/sec.
C29	0.605 Speed of light
A34	Time Delay = 139.99 ps
B34	Phase Delay = 0.504 degrees
A37	Temper: rise per RF Power is 0.0135 C/W
B37	Maximul RF Power not to exceed 100C rise above ambient is 7376.W
A40	Loss (dB/in) vs. Frequen (GHz)
B40	Diell Loss
C40	Cond Loss
D40	Total Loss
A41	1 -0.009 -0.022 -0.032 #####
B41	2 -0.018 -0.035 -0.054 #####
C41	3 -0.027 -0.047 -0.075 1.21E+00
D41	4 -0.036 -0.058 -0.095 #####
E41	5 -0.046 -0.068 -0.114 #####
F41	6 -0.055 -0.078 -0.133 #####
G41	7 -0.064 -0.087 -0.151 #####



MWI-2018 Software Instruction Manual

Software Operations, Grounded Coplanar Waveguide

The screenshot shows the MWI-2018 software interface for a Conductor Backed Coplanar Waveguide. The top left features a diagram of the waveguide structure with labels for conductor width (W), space (S), gap (GS), thickness (T), and height (H). Below the diagram is the text "Conductor Backed Coplanar Waveguide" and "This model assumes ideal via placement".

The main interface is divided into several sections:

- Material Selection:** A table listing various materials with columns for Material Name, Bulk Dk, Df, TC Dk, and Them Cor.
- Material Properties:** Fields for Material (RO4350B), Thickness (0.020 in.), Dk (3.66), Df (0.0037), and Thermal Cond. (0.62 W/Km).
- Conductor Parameters:** Fields for Thickness (0.0006 in.), Surface Area Index (1/2oz ED), Conductivity (5.813 X 10⁻⁷ S/m), Surface Roughness (RMS) (2.8 microns), and Avg Nodule Size (0.28 microns).
- Circuit Parameters:** Fields for Conductor Width (W) (0.043 in.), Space (S) (0.009 in.), and Length (1 in.).
- Options:** Radio buttons for "Analytical", "Synthesis Width", and "Synthesis Space". A "Calculate" button is present.
- Frequency:** Fields for Frequency (1 GHz) and Freq. Range (1 to 30 GHz).

At the bottom left, there is a checkbox for "Display results of only one calculation".

Click on Design Type, then Coplanar, then Conductor Backed

Typically this model has some accuracy issues with thinner constructions and copper thickness variance.

Since this model cannot determine the effects of grounding via's on impedance and loss, some differences may occur between an actual circuit and this model

MWI-2018 Software Instruction Manual

Software Operations, Microstrip Edge Coupled

The screenshot displays the MWI-2018 software interface. At the top left, there is a diagram of an edge-coupled microstrip structure with labels for width (W), space (S), and height (H). Below the diagram, the text 'Edge Coupled Microstrip' is visible. The main window is divided into several sections:

- Program Design Type Information:** Shows the current design type as 'Edge Coupled Microstrip'.
- Material Properties:** A table listing various materials with their properties. The selected material is RO4350B.
- Conductor Parameters:** Settings for the conductor, including thickness (T), surface area index, and roughness values.
- Material Properties Table:**

Material Name	Bulk Dk	Df	TC Dk	Them Con
RT/duroid 5870	2.33	0.0012	-115	0.22
RT/duroid 5880	2.2	0.0009	-125	0.2
RT/duroid 5880LZ	1.96	0.0019	22	0.2
RT/duroid 6002	2.94	0.0012	12	0.6
RT/duroid 6010LM	10.7	0.0023	-425	0.78
RT/duroid 6035HTC	3.6	0.0013	-65	1.44
RT/duroid 6202	2.94	0.0015	13	0.68
TMM3	3.45	0.002	37	0.7
TMM4	4.7	0.002	-15.3	0.7
TMM6	6.3	0.0023	-11	0.72
TMM10	9.8	0.0022	-38	0.76

Material Properties:

Material	Thickness (H)
RO4350B	0.020 in.

Dk	Df	Thermal Cond.
3.66	0.0037	0.62 W/K*m

Conductor Parameters:

Thickness (T)	Surface Area Index	Roughness loss model
0.0006 in.	3.8	Hall-Huray

Conductor Properties:

Conductivity	Avg Nodule Size (microns)	Surface Roughness (RMS)
5.813×10^{-7} S/m	0.28	2.8 microns

Material Properties:

- use z-axis Bulk Dk values
- Dk values for a specific frequency
- Dk values for characteristic impedance

Conductor Parameters:

- Optimum for accuracy
- Actual measurement

Generate Tables and Files:

Frequency: 1 GHz

Freq. Range: 1 to 30 GHz

Impedance: 50 Ohms

Calculate

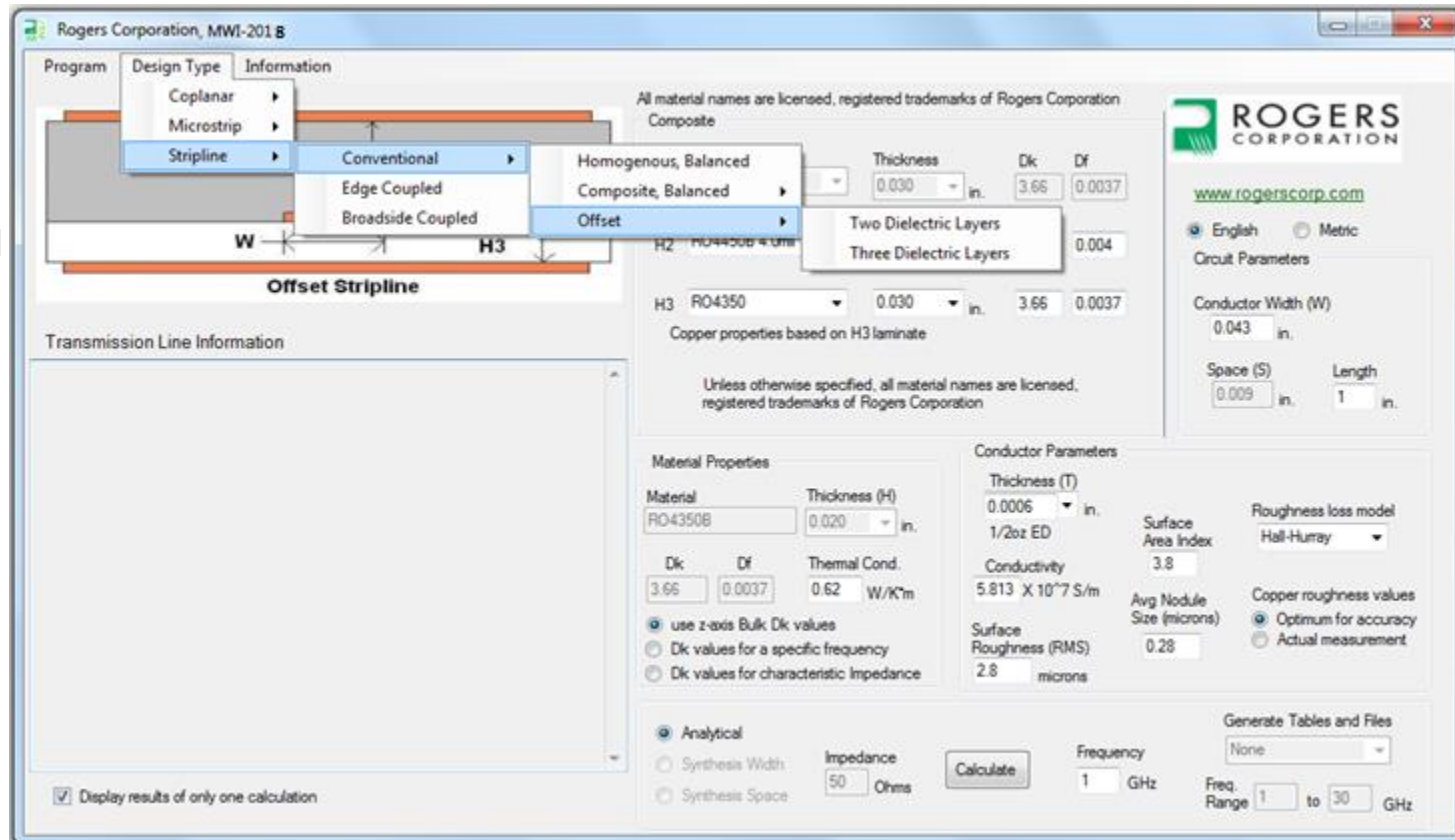
Display results of only one calculation

Click on Design Type, then Microstrip and then Edge Coupled

MWI-2018 Software Instruction Manual

Software Operations, Stripline line models

There are multiple methods to build stripline circuits and additional models have been added to consider the most common constructions.



MWI-2018 Software Instruction Manual

Software Operations, Stripline line models

For a composite or offset stripline circuit, the conductor roughness number is taken from the bottom substrate properties.

In this example the RO4000® family of materials are used. However any of Rogers' laminates can be chosen.

Rogers Corporation, MWI-2018

Program Design Type Information

Offset Stripline

Transmission Line Information

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Composite

Material	Thickness	Dk	Df
H1 RO4350	0.030 in.	3.66	0.0037
H2 RO4450B 4.0mil	0.0030 in.	3.90	0.004
H3 RO4350	0.030 in.	3.66	0.0037

Copper properties based on H3 laminate

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Material Properties

Material	Thickness (H)	Dk	Df	Thermal Cond.
RO4350B	0.020 in.	3.66	0.0037	0.62 W/K/m

Conductor Parameters

Thickness (T)	Surface Area Index	Conductivity	Surface Roughness (RMS)
0.0006 in.	3.8	5.813×10^{-7} S/m	2.8 microns

Roughness loss model: Hall-Huray

Copper roughness values: Optimum for accuracy

Material Properties: use z-axis Bulk Dk values

Conductor Parameters: Analytical

Impedance: 50 Ohms

Frequency: 1 GHz

Generate Tables and Files: None

Freq. Range: 1 to 30 GHz

Display results of only one calculation

ROGERS CORPORATION

www.rogerscorp.com

English Metric

Circuit Parameters

Conductor Width (W): 0.043 in.

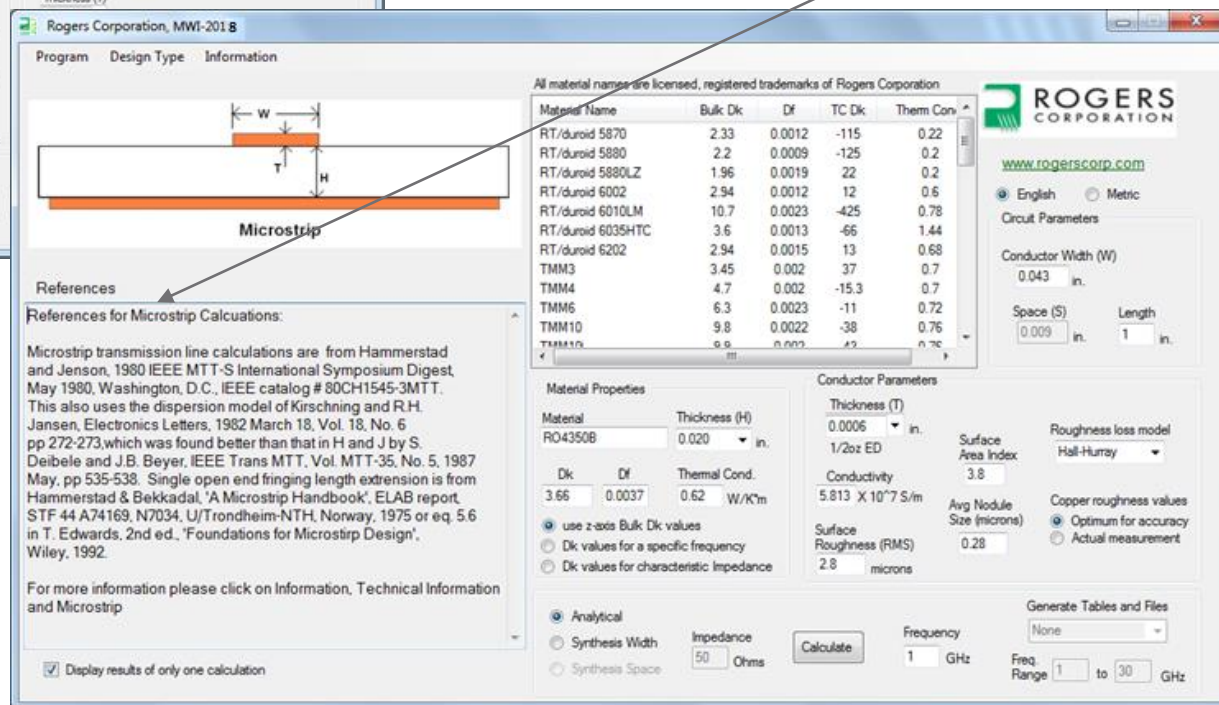
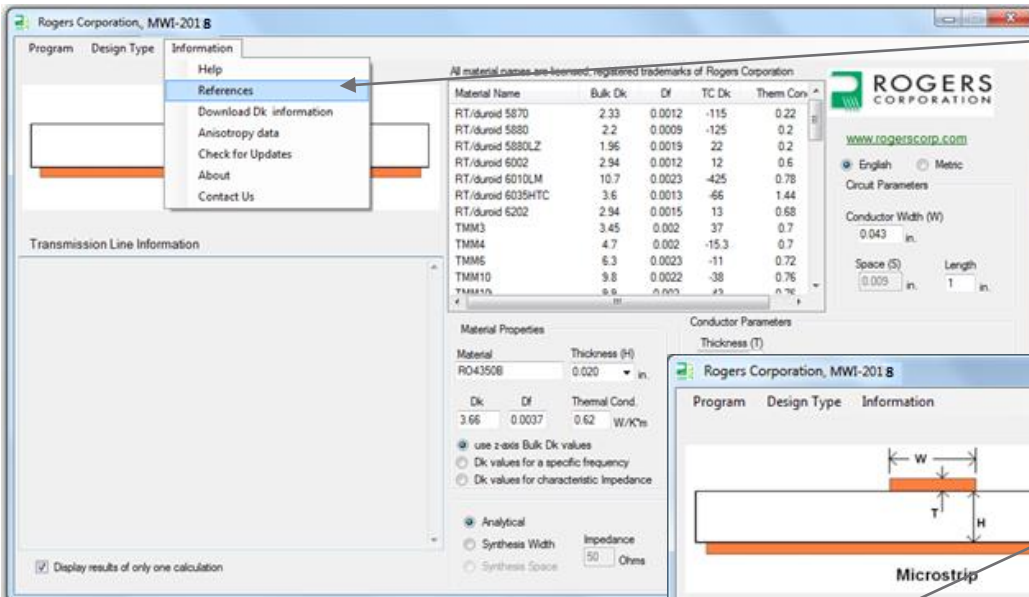
Space (S): 0.009 in. Length: 1 in.

MWI-2018 Software Instruction Manual

Software Operations, Reference information

User can get the references for whichever transmission line is selected.

Example to the left: after microstrip design is selected, click on Information and click on References. The technical references used for the calculations are shown.



MWI-2018 Software Instruction Manual

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