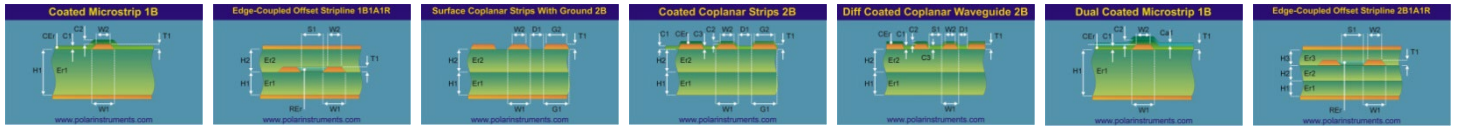
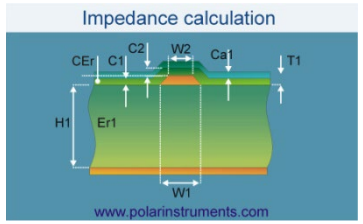
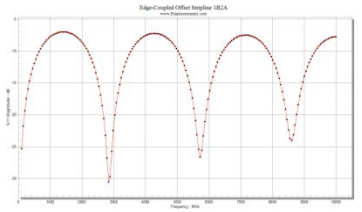
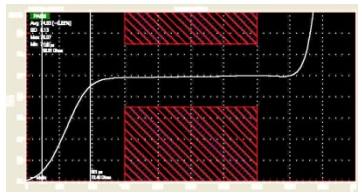
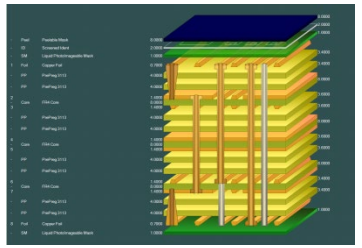
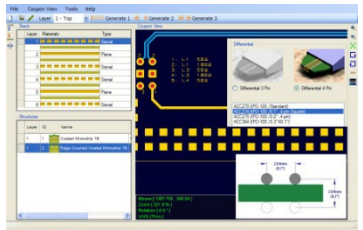






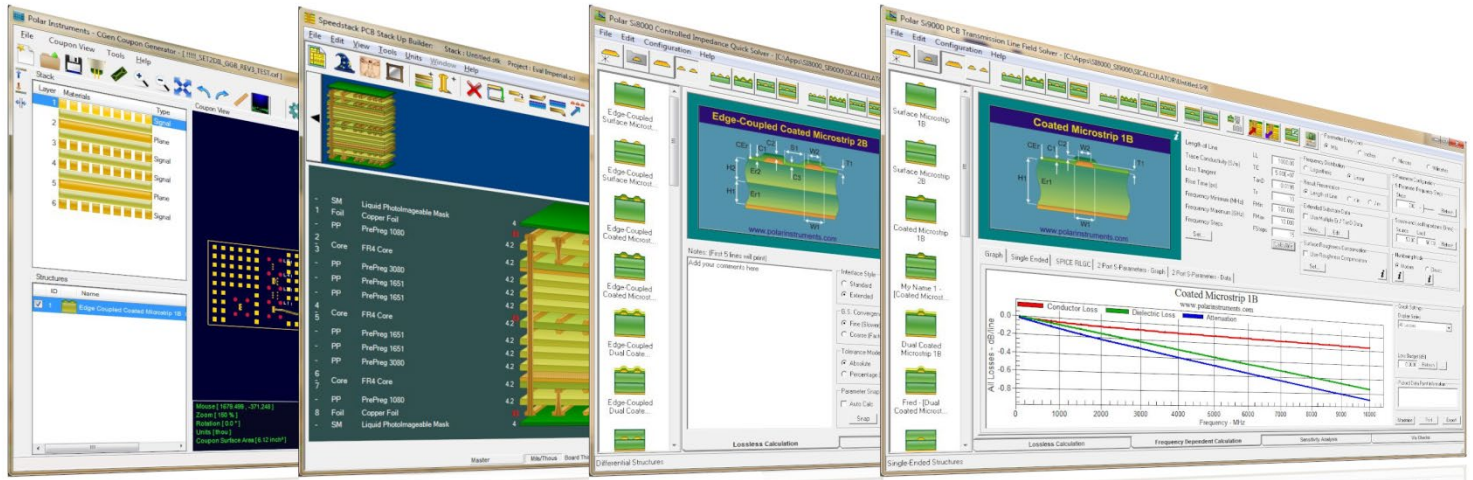




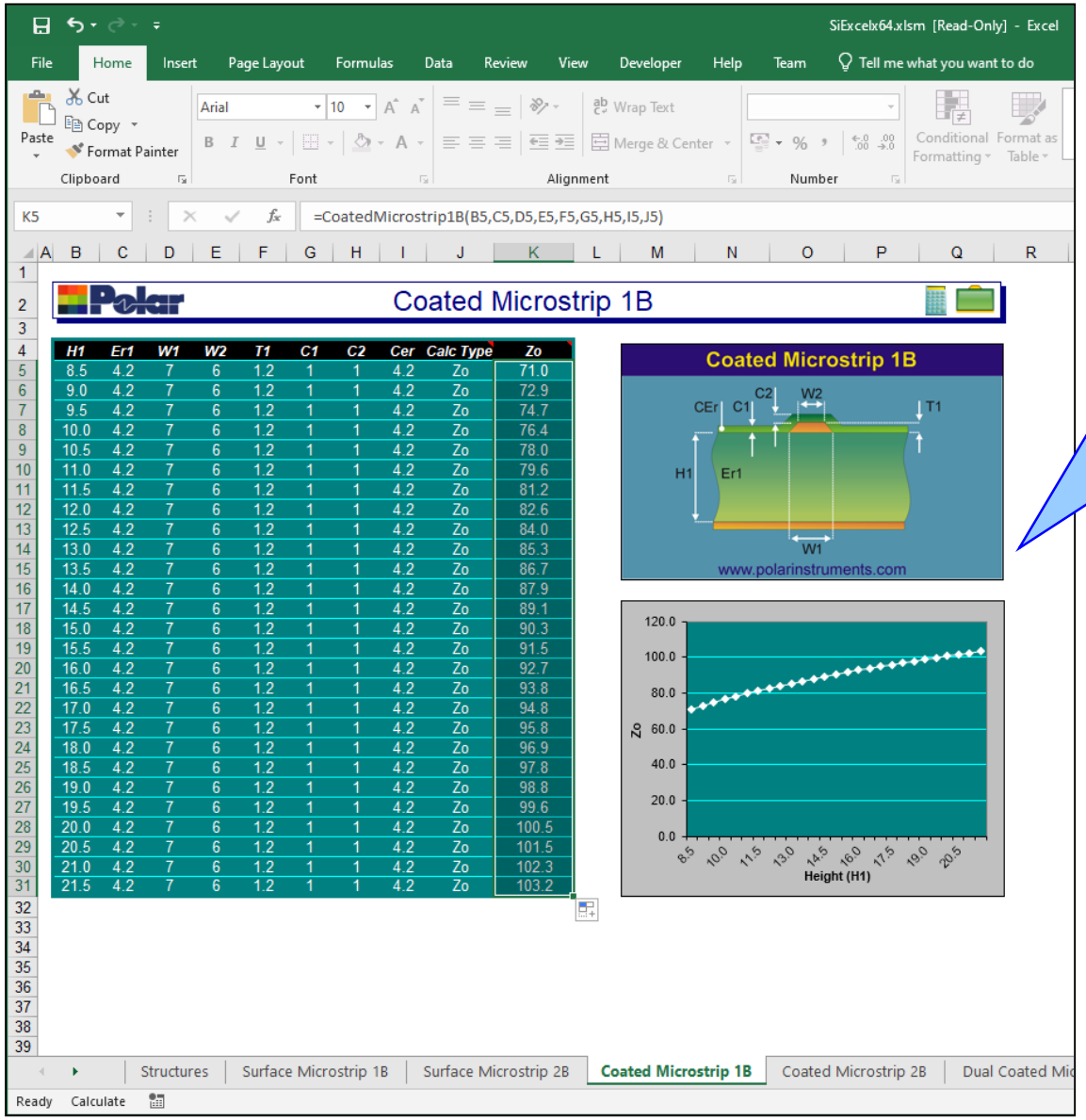


Si Excel Interface 2023

Now supports Excel 32 and 64 bit versions



Please note: the Si Excel examples shown in the following slides use Mils as the parameter units



Introducing the Si Excel Interface

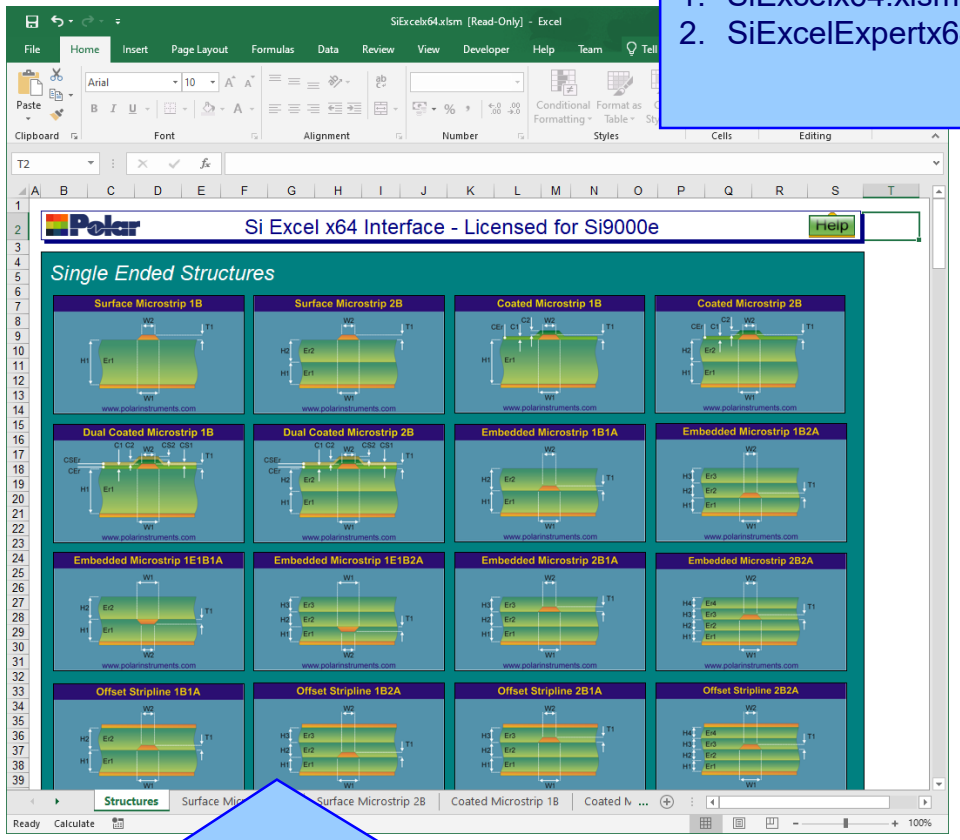
The Si Excel Interface is an add-on product to the Polar Si8000m and Si9000e.

It is a comprehensive lossless controlled impedance design tool which provides modelling for a wide variety of structures as a set of functions through a Microsoft® Excel user interface.

New for Nov 2022. Si Excel x64 now supports both Excel 32-bit and 64-bit environments.

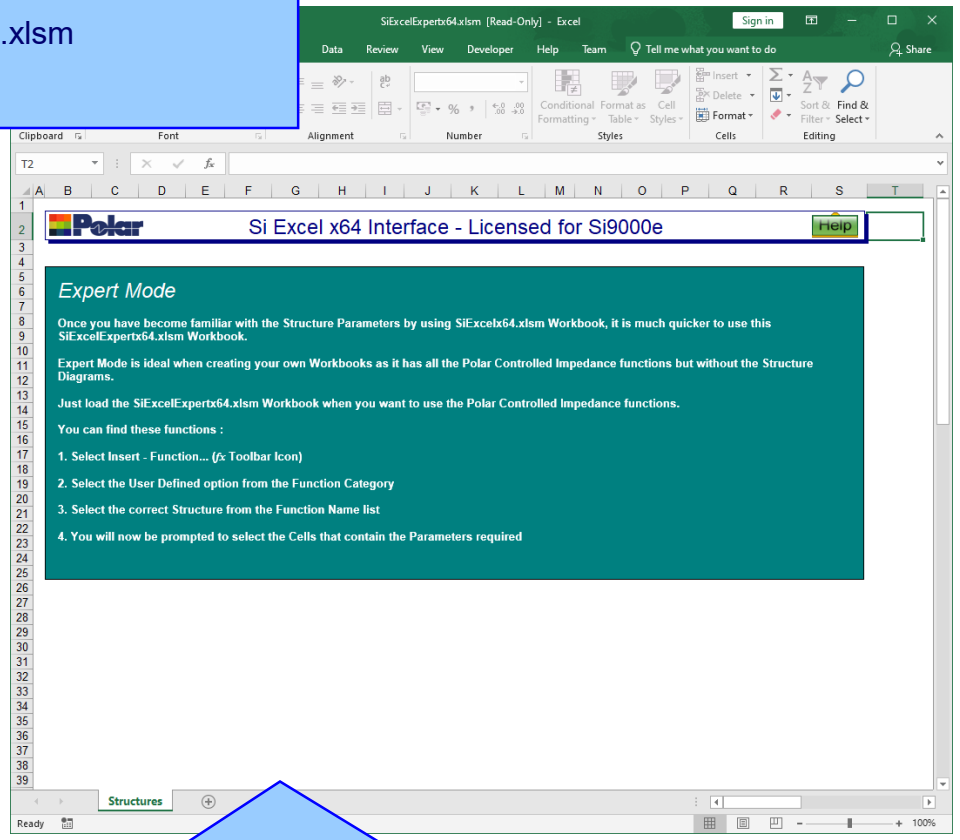
Two Excel interfaces

Si Excel delivers two Excel interfaces:
1. SiExcelx64.xlsm
2. SiExcelExpertx64.xlsm



SiExcelx64.xlsm

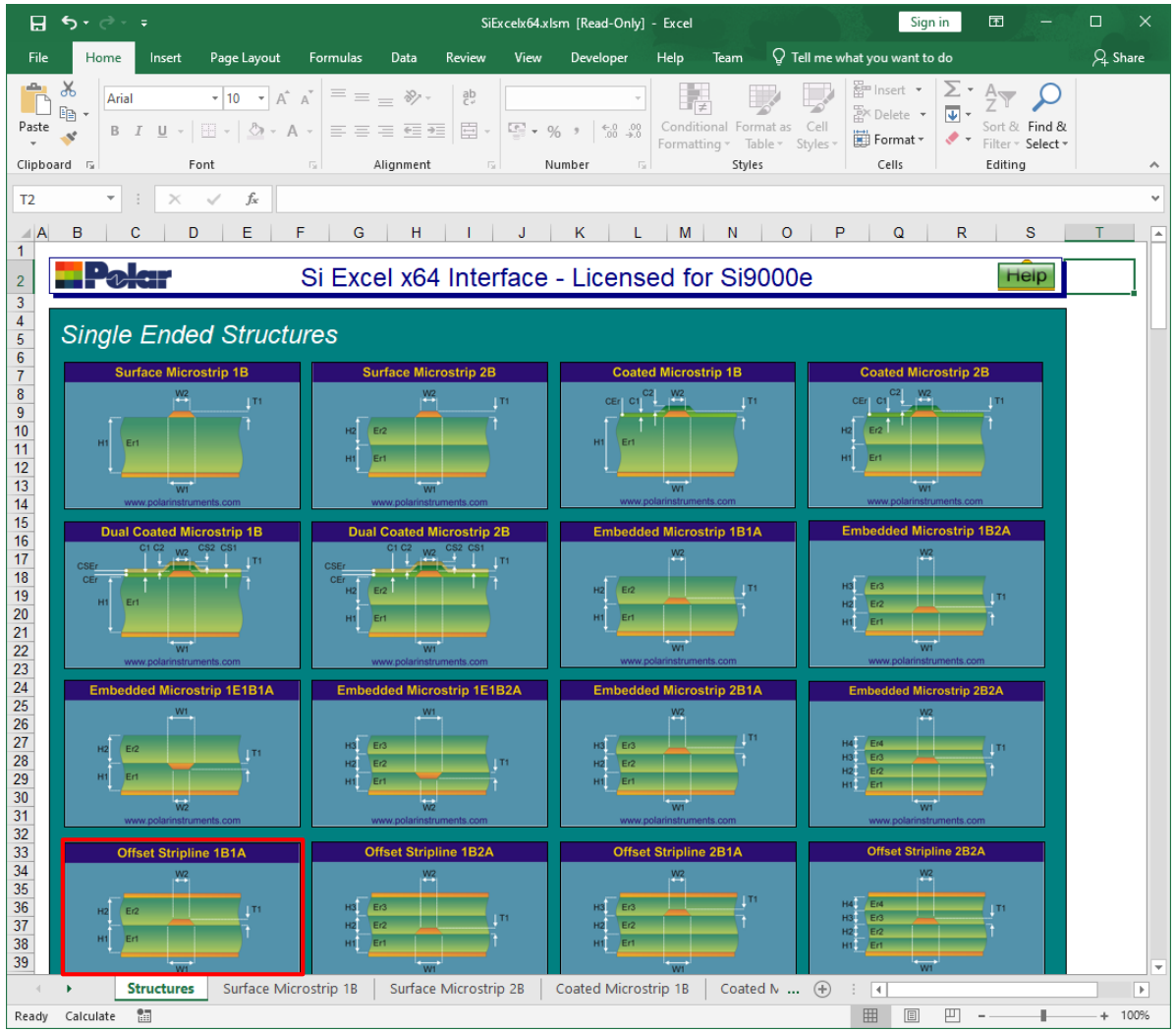
SiExcelx64.xlsm – a workbook containing sample worksheets of the most commonly used structures. Vary structure parameters and plot the impedance calculation results



SiExcelExpertx64.xlsm

SiExcelxExpert64.xlsm – a workbook that provides a link to the impedance structure functions that can be accessed from your own Excel workbooks. Use your own worksheet data as structure input parameters and embed the calculated result back to your worksheet cell(s)

Using the Si Excel Sample worksheets

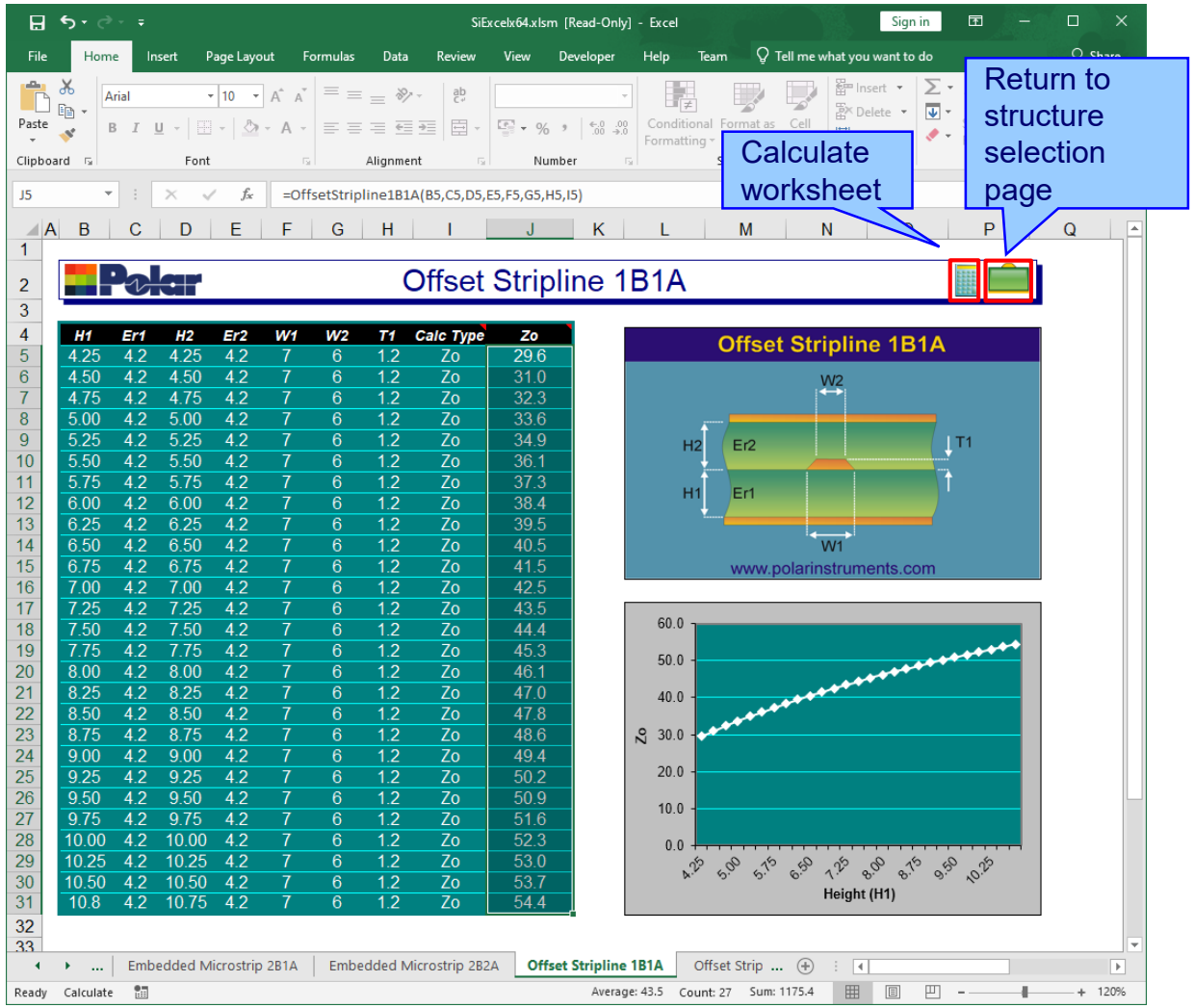


Step 1

Select the structure of interest from the structure thumbnail images.

For the example shown on the next slides we will select the Offset Stripline 1B1A structure

Using the Si Excel Sample worksheets



H1	Er1	H2	Er2	W1	W2	T1	Calc Type	Zo
4.25	4.2	4.25	4.2	7	6	1.2	Zo	29.6
4.50	4.2	4.50	4.2	7	6	1.2	Zo	31.0
4.75	4.2	4.75	4.2	7	6	1.2	Zo	32.3
5.00	4.2	5.00	4.2	7	6	1.2	Zo	33.6
5.25	4.2	5.25	4.2	7	6	1.2	Zo	34.9
5.50	4.2	5.50	4.2	7	6	1.2	Zo	36.1
5.75	4.2	5.75	4.2	7	6	1.2	Zo	37.3
6.00	4.2	6.00	4.2	7	6	1.2	Zo	38.4
6.25	4.2	6.25	4.2	7	6	1.2	Zo	39.5
6.50	4.2	6.50	4.2	7	6	1.2	Zo	40.5
6.75	4.2	6.75	4.2	7	6	1.2	Zo	41.5
7.00	4.2	7.00	4.2	7	6	1.2	Zo	42.5
7.25	4.2	7.25	4.2	7	6	1.2	Zo	43.5
7.50	4.2	7.50	4.2	7	6	1.2	Zo	44.4
7.75	4.2	7.75	4.2	7	6	1.2	Zo	45.3
8.00	4.2	8.00	4.2	7	6	1.2	Zo	46.1
8.25	4.2	8.25	4.2	7	6	1.2	Zo	47.0
8.50	4.2	8.50	4.2	7	6	1.2	Zo	47.8
8.75	4.2	8.75	4.2	7	6	1.2	Zo	48.6
9.00	4.2	9.00	4.2	7	6	1.2	Zo	49.4
9.25	4.2	9.25	4.2	7	6	1.2	Zo	50.2
9.50	4.2	9.50	4.2	7	6	1.2	Zo	50.9
9.75	4.2	9.75	4.2	7	6	1.2	Zo	51.6
10.00	4.2	10.00	4.2	7	6	1.2	Zo	52.3
10.25	4.2	10.25	4.2	7	6	1.2	Zo	53.0
10.50	4.2	10.50	4.2	7	6	1.2	Zo	53.7
10.8	4.2	10.75	4.2	7	6	1.2	Zo	54.4

Step 2

Here is the sample worksheet for the Offset Stripline 1B1A structure.

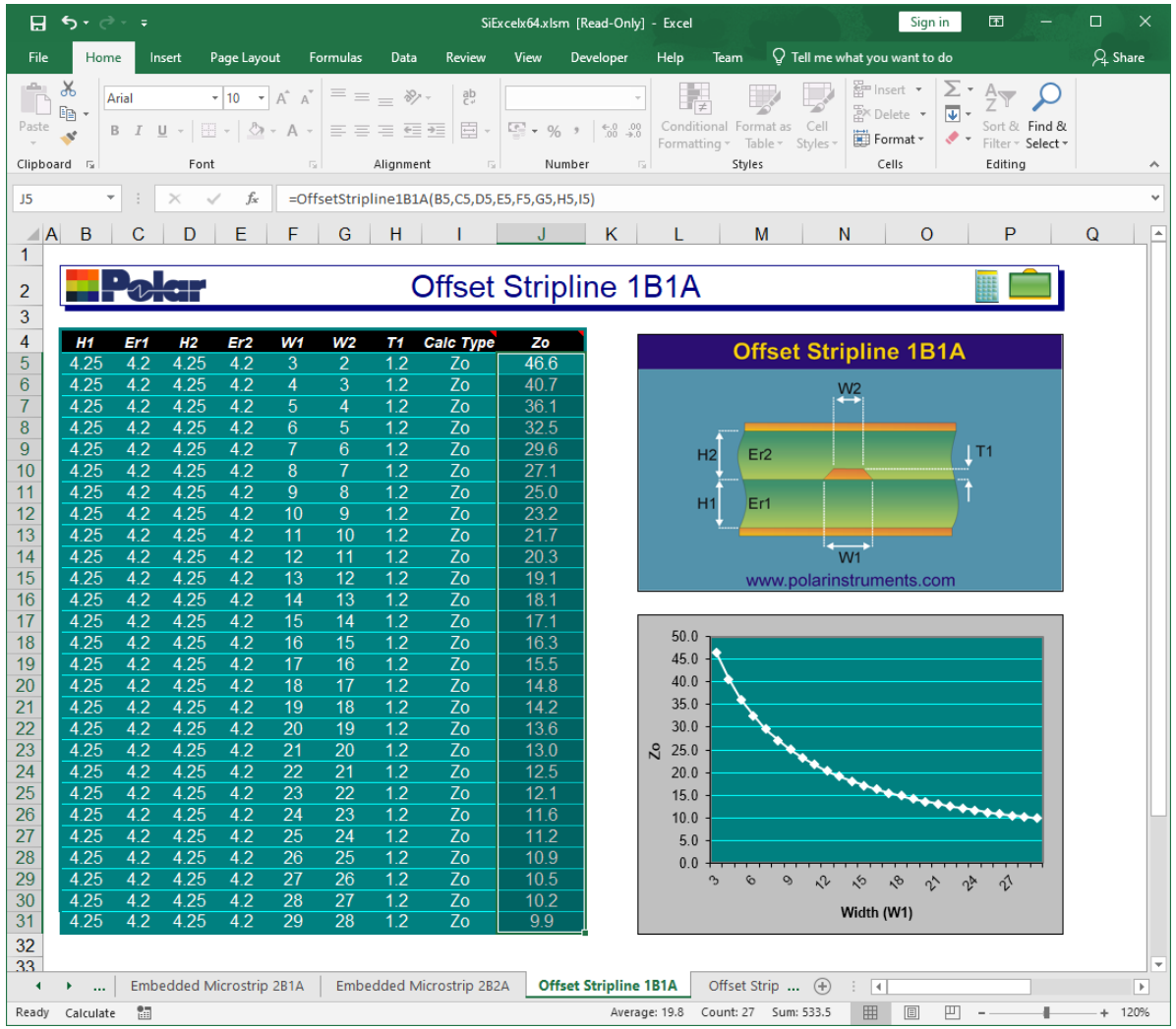
Row 4 shows the parameters required for this structure (H1, Er1, H2, Er2, W1, W2, T1 & CalcType) and the calculated impedance result (Zo) is displayed in column J. Notice that each row 5 through to 31 has increasing substrate heights H1 / H2.

Selecting cell J5 (Zo) and using the Excel autofill option to cell J31 allows the worksheet to be pre-configured to calculate every row.

Now select the calculator icon to calculate each row, on completion the plot will refresh.

From the plot you will notice that as H1 / H2 increases the impedance result (Zo) also increases

Using the Si Excel Sample worksheets



H1	Er1	H2	Er2	W1	W2	T1	Calc Type	Zo
4.25	4.2	4.25	4.2	3	2	1.2	Zo	46.6
4.25	4.2	4.25	4.2	4	3	1.2	Zo	40.7
4.25	4.2	4.25	4.2	5	4	1.2	Zo	36.1
4.25	4.2	4.25	4.2	6	5	1.2	Zo	32.5
4.25	4.2	4.25	4.2	7	6	1.2	Zo	29.6
4.25	4.2	4.25	4.2	8	7	1.2	Zo	27.1
4.25	4.2	4.25	4.2	9	8	1.2	Zo	25.0
4.25	4.2	4.25	4.2	10	9	1.2	Zo	23.2
4.25	4.2	4.25	4.2	11	10	1.2	Zo	21.7
4.25	4.2	4.25	4.2	12	11	1.2	Zo	20.3
4.25	4.2	4.25	4.2	13	12	1.2	Zo	19.1
4.25	4.2	4.25	4.2	14	13	1.2	Zo	18.1
4.25	4.2	4.25	4.2	15	14	1.2	Zo	17.1
4.25	4.2	4.25	4.2	16	15	1.2	Zo	16.3
4.25	4.2	4.25	4.2	17	16	1.2	Zo	15.5
4.25	4.2	4.25	4.2	18	17	1.2	Zo	14.8
4.25	4.2	4.25	4.2	19	18	1.2	Zo	14.2
4.25	4.2	4.25	4.2	20	19	1.2	Zo	13.6
4.25	4.2	4.25	4.2	21	20	1.2	Zo	13.0
4.25	4.2	4.25	4.2	22	21	1.2	Zo	12.5
4.25	4.2	4.25	4.2	23	22	1.2	Zo	12.1
4.25	4.2	4.25	4.2	24	23	1.2	Zo	11.6
4.25	4.2	4.25	4.2	25	24	1.2	Zo	11.2
4.25	4.2	4.25	4.2	26	25	1.2	Zo	10.9
4.25	4.2	4.25	4.2	27	26	1.2	Zo	10.5
4.25	4.2	4.25	4.2	28	27	1.2	Zo	10.2
4.25	4.2	4.25	4.2	29	28	1.2	Zo	9.9

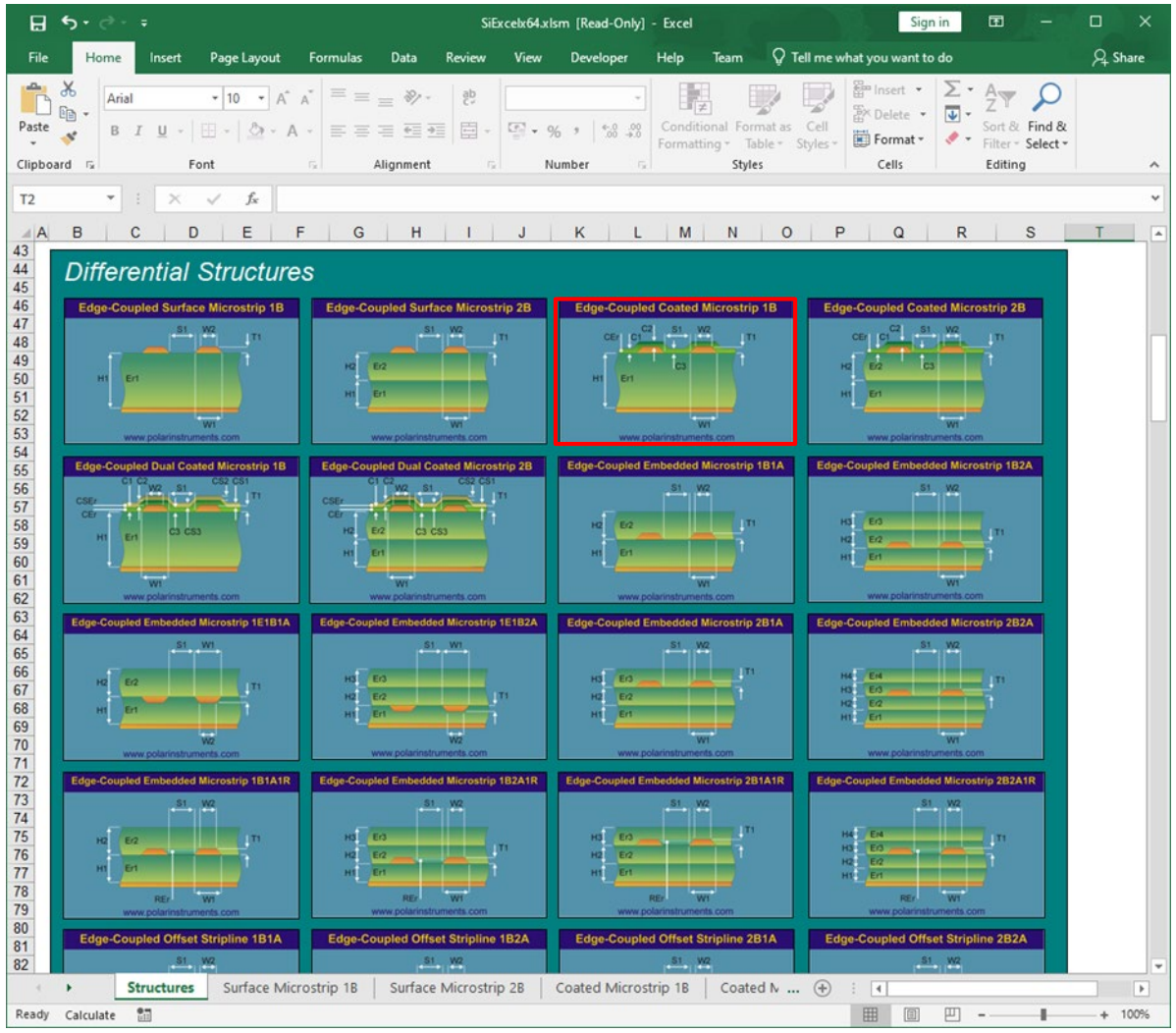
Step 3

In this example we have changed the H1 / H2 parameters to have a constant 4.25 mils. We have also set W1 / W2 to increase from 3 mils (row 5) to 29 mils (row 31)

The final step is to change the graph properties to present the Width data on the X-axis

On calculation completion you will note from the plot that as W1 / W2 increases the impedance result (Zo) decreases.

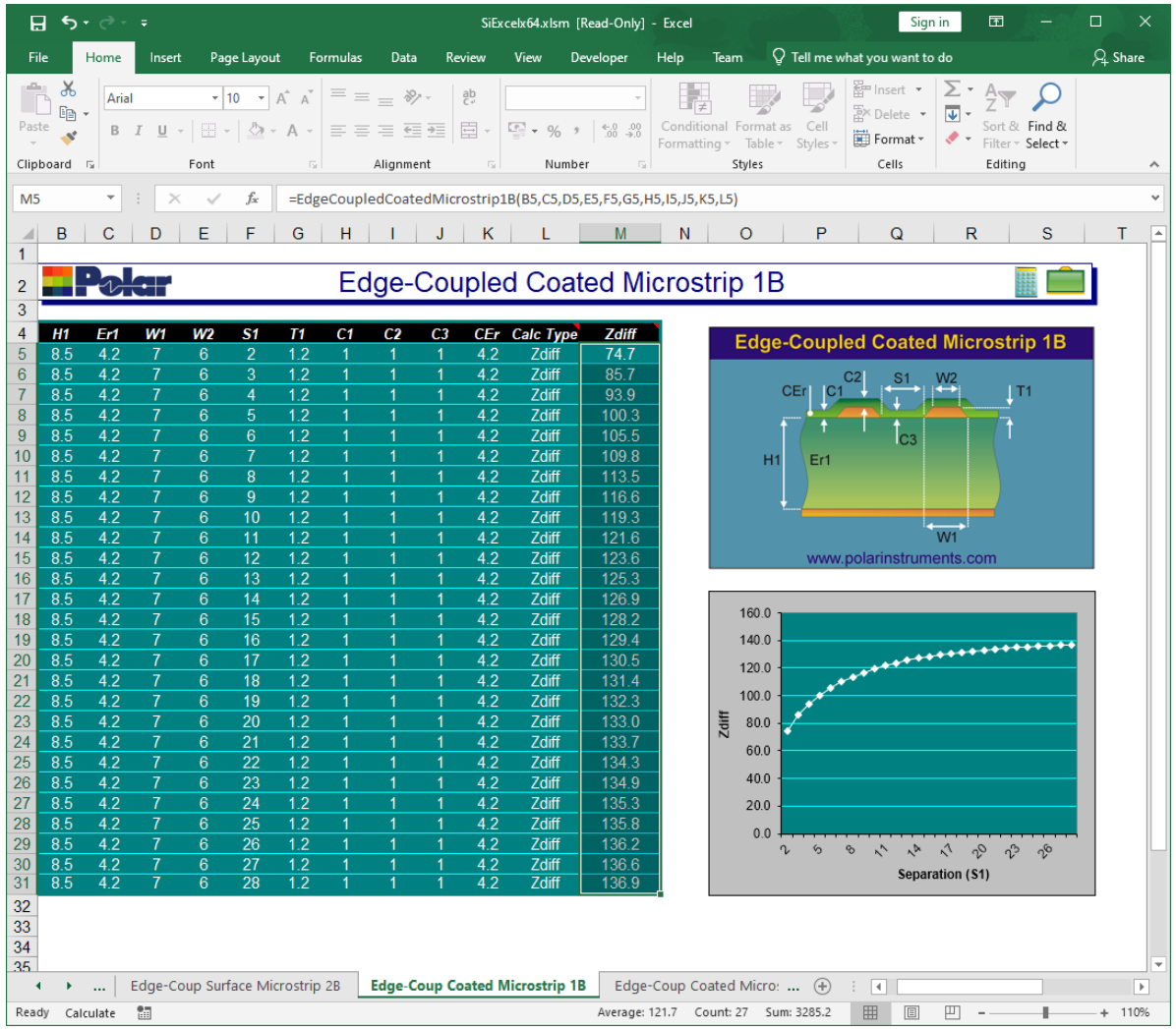
Using the Si Excel Sample worksheets



Step 4

For the next example we will select the Edge-Coupled Coated Microstrip 1B structure.

Using the Si Excel Sample worksheets



H1	Er1	W1	W2	S1	T1	C1	C2	C3	CEr	Calc Type	Zdiff
8.5	4.2	7	6	2	1.2	1	1	1	4.2	Zdiff	74.7
8.5	4.2	7	6	3	1.2	1	1	1	4.2	Zdiff	85.7
8.5	4.2	7	6	4	1.2	1	1	1	4.2	Zdiff	93.9
8.5	4.2	7	6	5	1.2	1	1	1	4.2	Zdiff	100.3
8.5	4.2	7	6	6	1.2	1	1	1	4.2	Zdiff	105.5
8.5	4.2	7	6	7	1.2	1	1	1	4.2	Zdiff	109.8
8.5	4.2	7	6	8	1.2	1	1	1	4.2	Zdiff	113.5
8.5	4.2	7	6	9	1.2	1	1	1	4.2	Zdiff	116.6
8.5	4.2	7	6	10	1.2	1	1	1	4.2	Zdiff	119.3
8.5	4.2	7	6	11	1.2	1	1	1	4.2	Zdiff	121.6
8.5	4.2	7	6	12	1.2	1	1	1	4.2	Zdiff	123.6
8.5	4.2	7	6	13	1.2	1	1	1	4.2	Zdiff	125.3
8.5	4.2	7	6	14	1.2	1	1	1	4.2	Zdiff	126.9
8.5	4.2	7	6	15	1.2	1	1	1	4.2	Zdiff	128.2
8.5	4.2	7	6	16	1.2	1	1	1	4.2	Zdiff	129.4
8.5	4.2	7	6	17	1.2	1	1	1	4.2	Zdiff	130.5
8.5	4.2	7	6	18	1.2	1	1	1	4.2	Zdiff	131.4
8.5	4.2	7	6	19	1.2	1	1	1	4.2	Zdiff	132.3
8.5	4.2	7	6	20	1.2	1	1	1	4.2	Zdiff	133.0
8.5	4.2	7	6	21	1.2	1	1	1	4.2	Zdiff	133.7
8.5	4.2	7	6	22	1.2	1	1	1	4.2	Zdiff	134.3
8.5	4.2	7	6	23	1.2	1	1	1	4.2	Zdiff	134.9
8.5	4.2	7	6	24	1.2	1	1	1	4.2	Zdiff	135.3
8.5	4.2	7	6	25	1.2	1	1	1	4.2	Zdiff	135.8
8.5	4.2	7	6	26	1.2	1	1	1	4.2	Zdiff	136.2
8.5	4.2	7	6	27	1.2	1	1	1	4.2	Zdiff	136.6
8.5	4.2	7	6	28	1.2	1	1	1	4.2	Zdiff	136.9

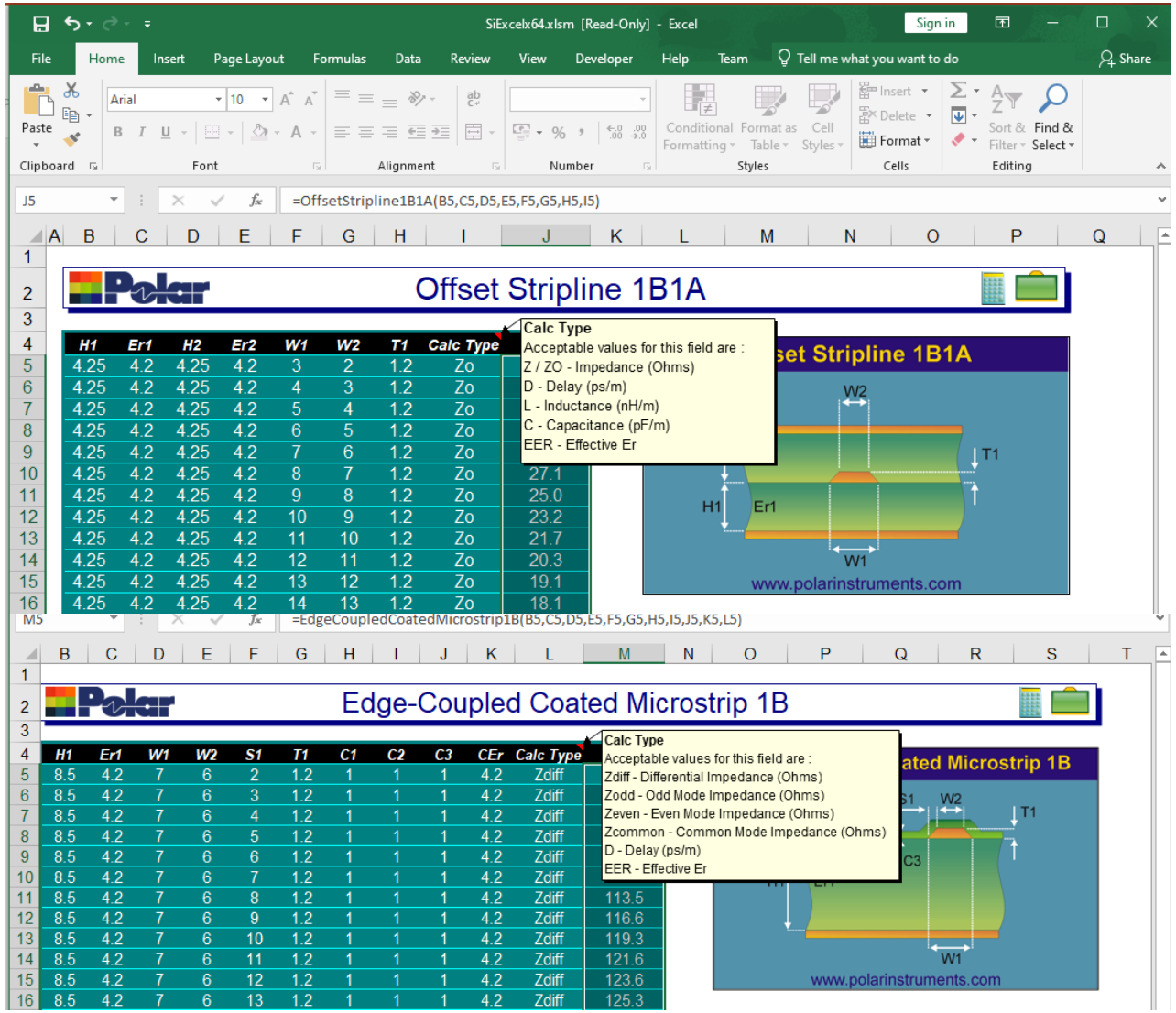
Step 5

With H1 set to a constant value of 8.5 mils we will now sweep the Trace Separation (S1) from 2 mils (row 5) to 28 mils (row 31).

A quick change to the graph properties will present the Separation data on the X-axis

On calculation completion you will note from the plot that as S1 increases the differential impedance result (Zdiff) increases. However, you will notice that after ~20 mils, increasing the S1 has negligible impact of the differential impedance result.

Using the Si Excel Sample worksheets

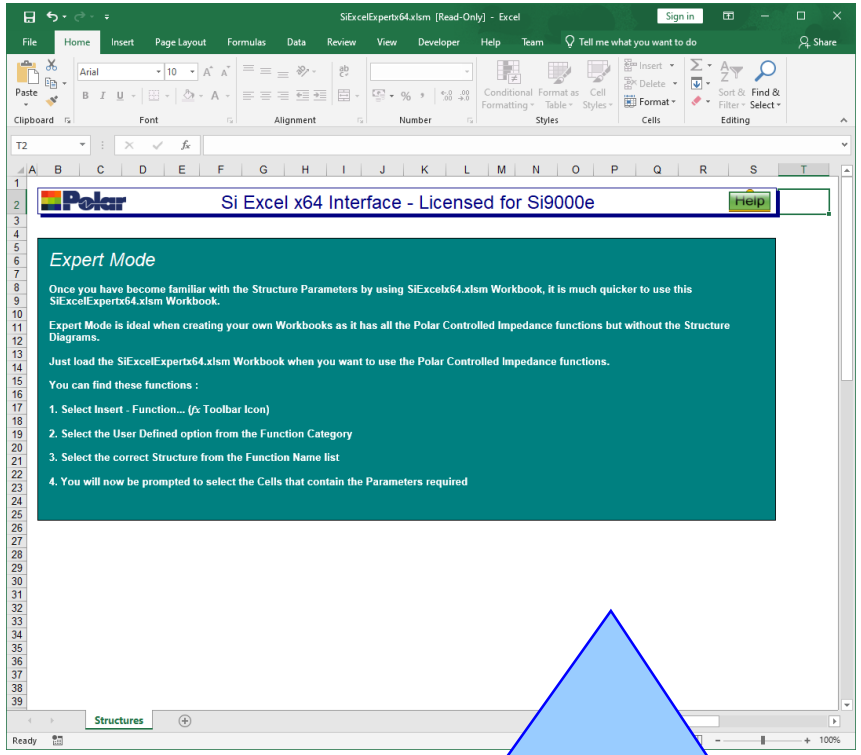


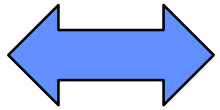
Calc Type

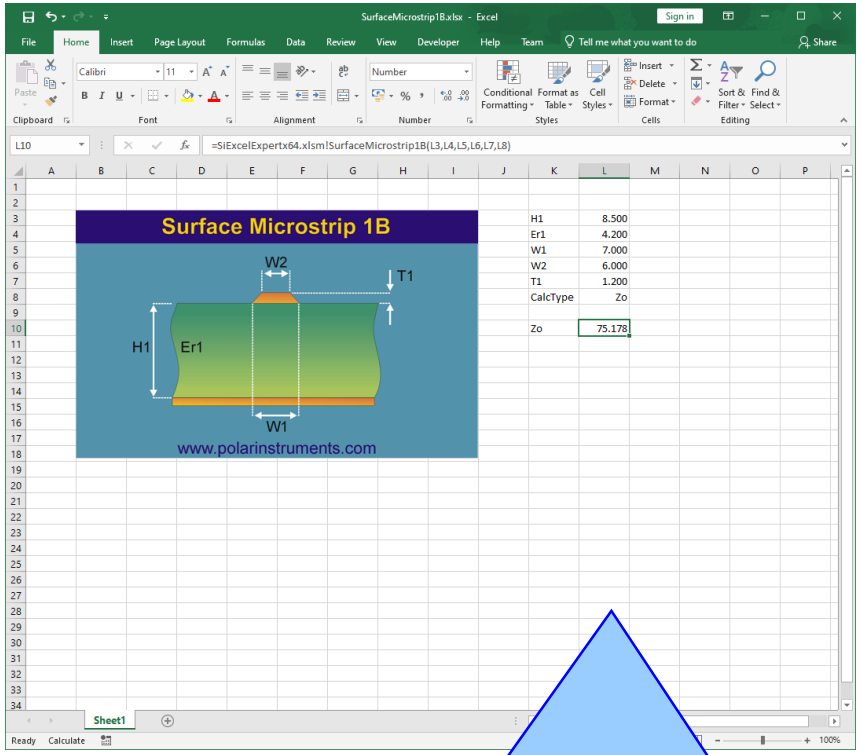
In addition to calculating single-ended impedance (Zo) and differential impedance (Zdiff), the Calc Type parameter can be changed to return other results.

This is especially useful for designs with differential structures where differential (Zdiff) and common mode impedance (Zcommon) are often required as part of the design specification.

Using Si Excel Expert to link other workbooks







SiExcelExpert.x64.xlsm

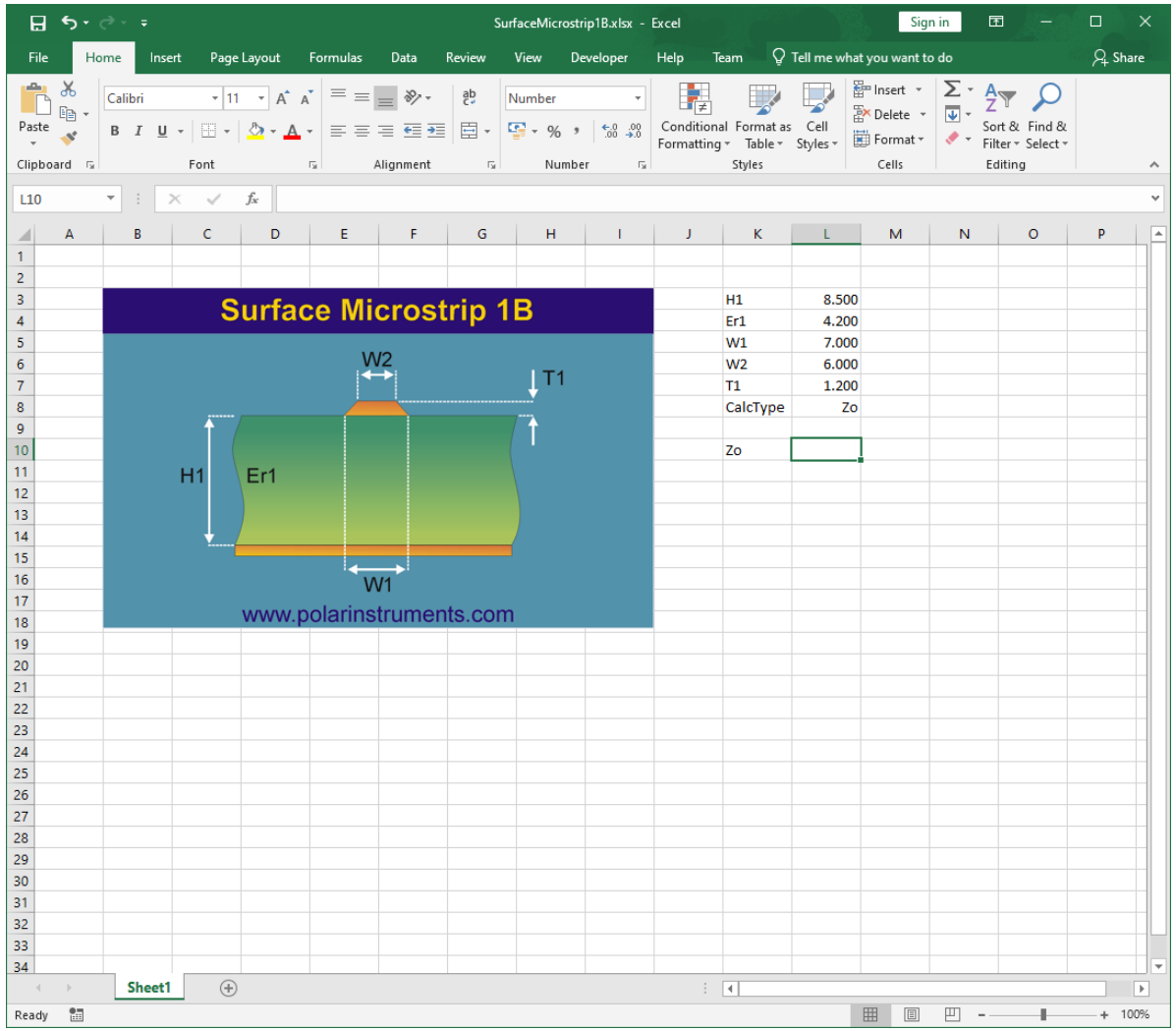
The Si Excel Expert workbook provides access to 120+ controlled impedance structure functions.

Once opened in Excel, this workbook can be referenced by other workbooks

Your own workbooks

From within your own workbook, insert controlled impedance structure functions as you would any other Excel function. The calculated result is then placed in the worksheet cell

Using Si Excel Expert to link other workbooks



Example #1: Step 1

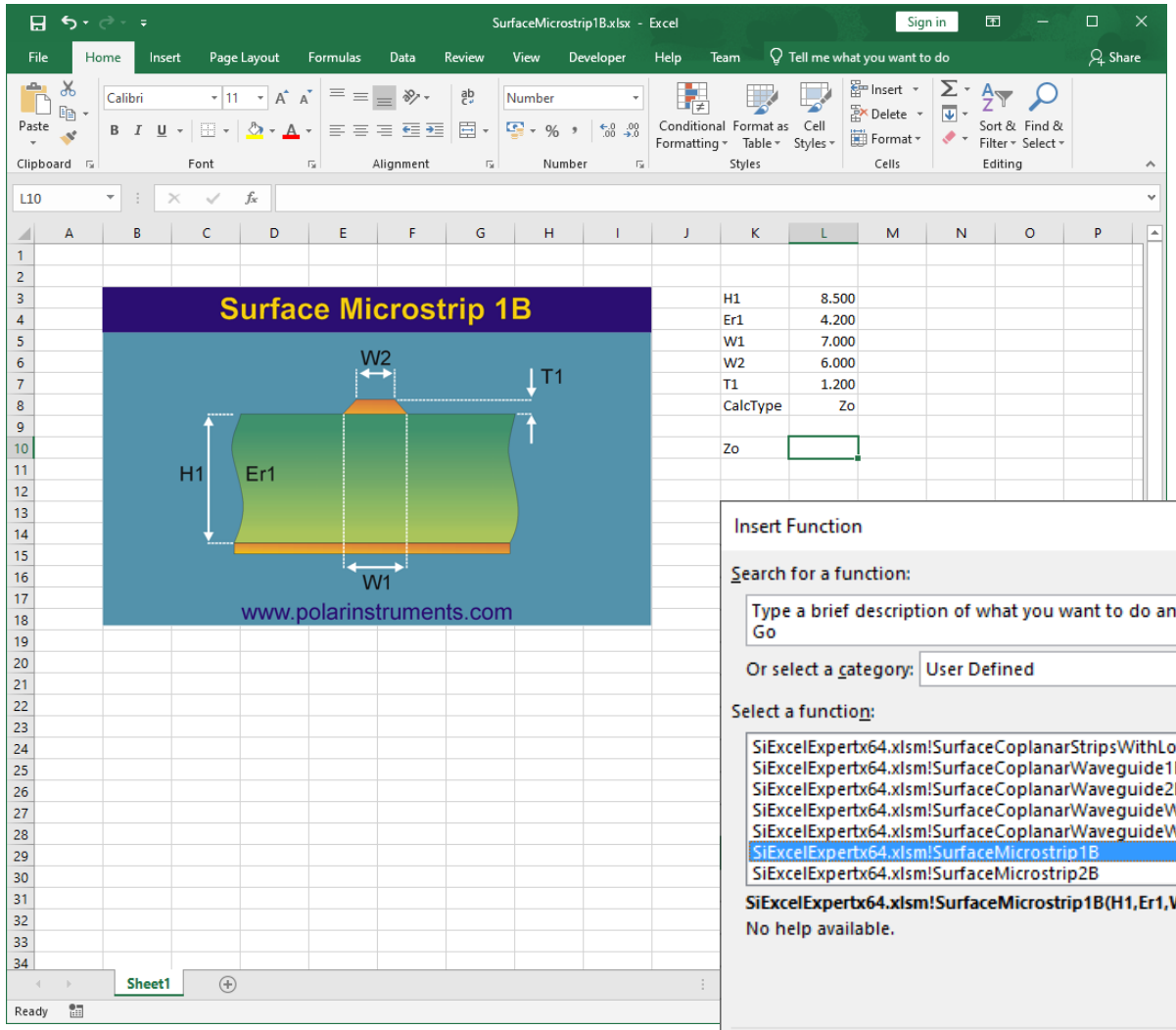
Enter the parameter values required for the structure into separate cells. The structure images guide you through the parameter usage for each structure.

For the Surface Microstrip 1B structure, the structure image shows that the following parameters are required:

H1, Er1, W1, W2, T1

CalcType = Zo (single-ended impedance)

Using Si Excel Expert to link other workbooks



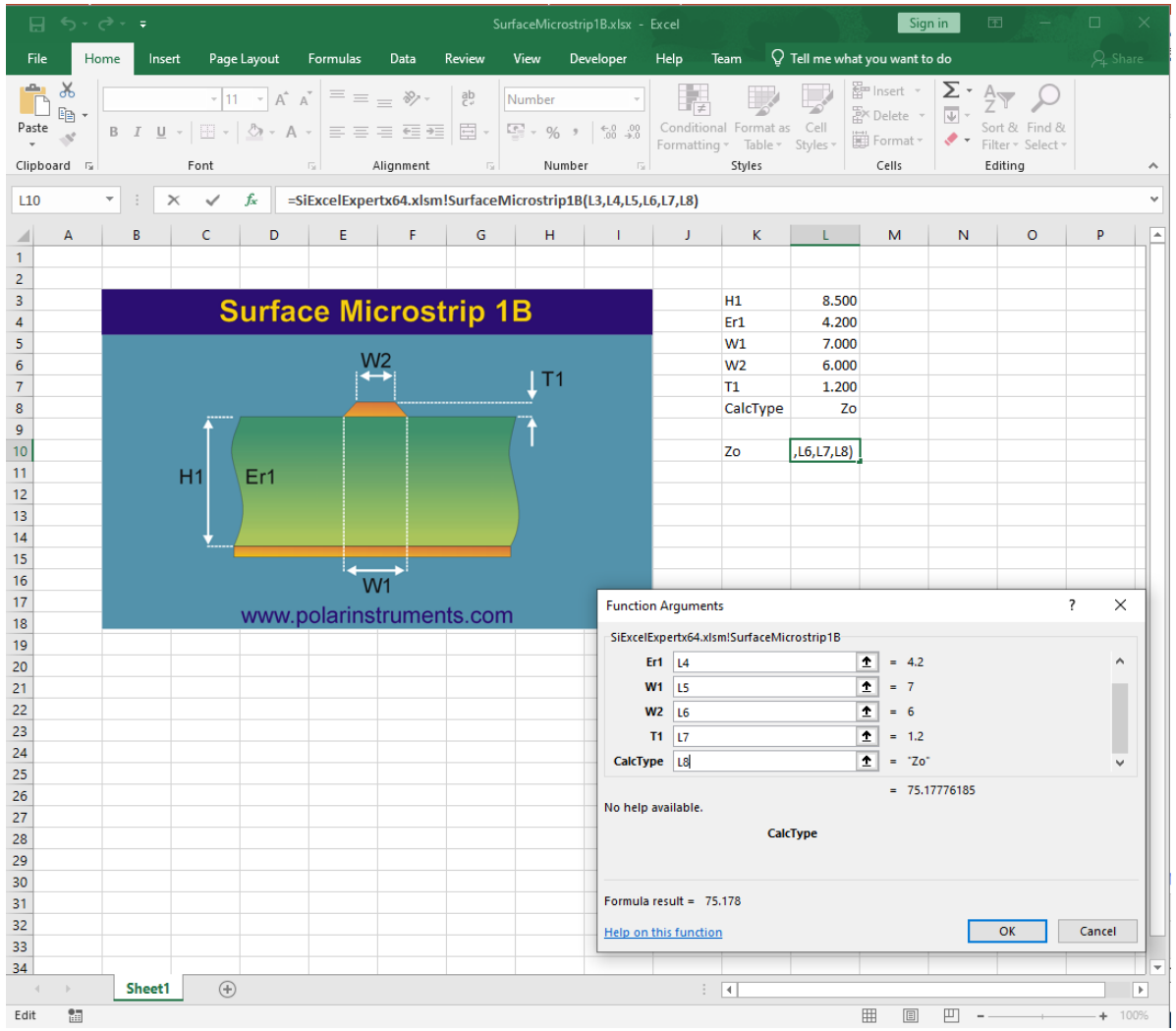
Example #1: Step 2

Select cell L10 to contain the calculated result and use the Insert Function option.

Under the User Defined category browse to SiExcelExpert.x64.xlsm!SurfaceMicrostrip1B structure.

Now select OK

Using Si Excel Expert to link other workbooks



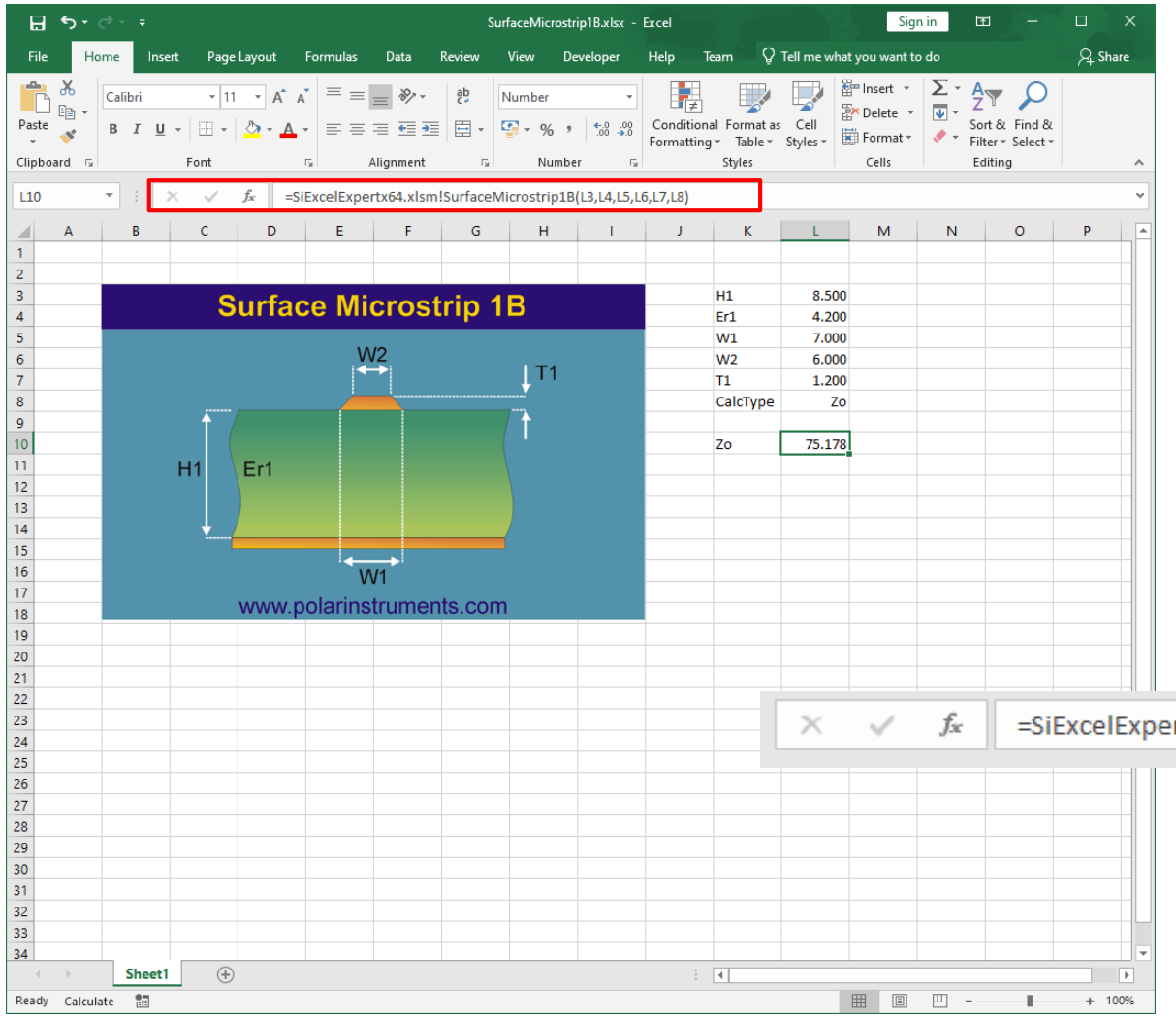
Example #1: Step 3

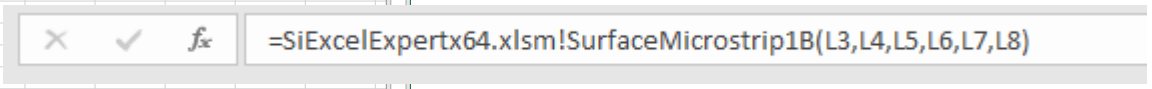
The SurfaceMicrostrip1B function prompts for the cells required for the structure input parameters. In this example we select cells L3, L4, L5, L6, L7, L8 which contain the parameter values we wish to use.

On selecting the last parameter, cell L8 containing the CalcType, the calculated impedance is displayed as 75.17776 ohms.

Selecting OK will return this value to the worksheet cell L10

Using Si Excel Expert to link other workbooks





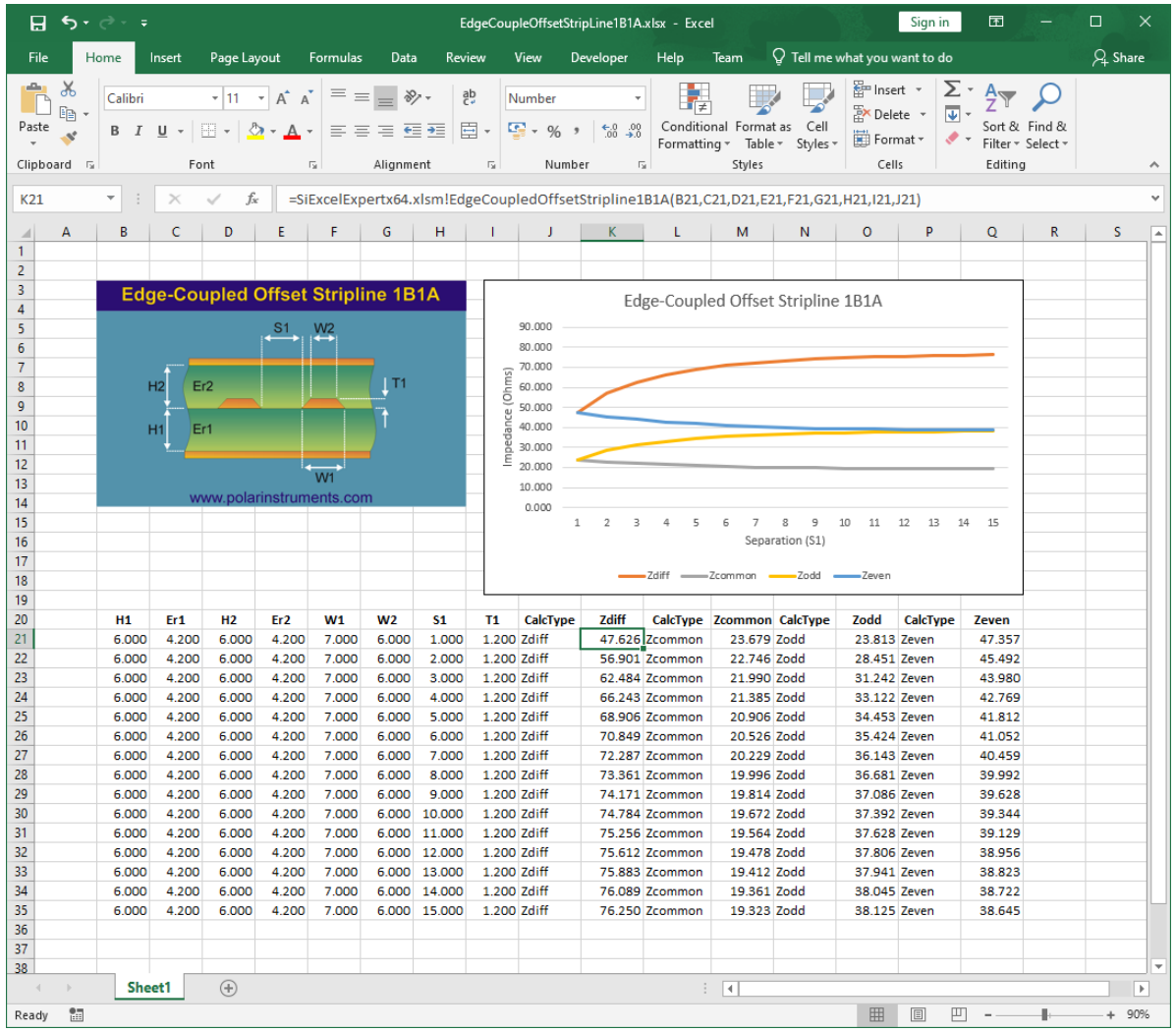
Example #1: Step 4

Once the Excel Insert Function and Function Arguments dialogs are dismissed, the calculated result can be seen in cell L10 of the worksheet

The formula bar shows the full syntax of the SurfaceMicrostrip1B function. Note the reference to the SiExcelExpert.x64.xlsm which is also open in the Excel environment.

Changing any parameter cell value will require the Excel F9 – calculate all worksheets option to refresh the impedance result

Using Si Excel Expert to link other workbooks



H1	Er1	H2	Er2	W1	W2	S1	T1	CalcType	Zdiff	CalcType	Zcommon	CalcType	Zodd	CalcType	Zeven
6.000	4.200	6.000	4.200	7.000	6.000	1.000	1.200	Zdiff	47.626	Zcommon	23.679	Zodd	23.813	Zeven	47.357
6.000	4.200	6.000	4.200	7.000	6.000	2.000	1.200	Zdiff	56.901	Zcommon	22.746	Zodd	28.451	Zeven	45.492
6.000	4.200	6.000	4.200	7.000	6.000	3.000	1.200	Zdiff	62.484	Zcommon	21.990	Zodd	31.242	Zeven	43.980
6.000	4.200	6.000	4.200	7.000	6.000	4.000	1.200	Zdiff	66.243	Zcommon	21.385	Zodd	33.122	Zeven	42.769
6.000	4.200	6.000	4.200	7.000	6.000	5.000	1.200	Zdiff	68.906	Zcommon	20.906	Zodd	34.453	Zeven	41.812
6.000	4.200	6.000	4.200	7.000	6.000	6.000	1.200	Zdiff	70.849	Zcommon	20.526	Zodd	35.424	Zeven	41.052
6.000	4.200	6.000	4.200	7.000	6.000	7.000	1.200	Zdiff	72.287	Zcommon	20.229	Zodd	36.143	Zeven	40.459
6.000	4.200	6.000	4.200	7.000	6.000	8.000	1.200	Zdiff	73.361	Zcommon	19.996	Zodd	36.681	Zeven	39.992
6.000	4.200	6.000	4.200	7.000	6.000	9.000	1.200	Zdiff	74.171	Zcommon	19.814	Zodd	37.086	Zeven	39.628
6.000	4.200	6.000	4.200	7.000	6.000	10.000	1.200	Zdiff	74.784	Zcommon	19.672	Zodd	37.392	Zeven	39.344
6.000	4.200	6.000	4.200	7.000	6.000	11.000	1.200	Zdiff	75.256	Zcommon	19.564	Zodd	37.628	Zeven	39.129
6.000	4.200	6.000	4.200	7.000	6.000	12.000	1.200	Zdiff	75.612	Zcommon	19.478	Zodd	37.806	Zeven	38.956
6.000	4.200	6.000	4.200	7.000	6.000	13.000	1.200	Zdiff	75.883	Zcommon	19.412	Zodd	37.941	Zeven	38.823
6.000	4.200	6.000	4.200	7.000	6.000	14.000	1.200	Zdiff	76.089	Zcommon	19.361	Zodd	38.045	Zeven	38.722
6.000	4.200	6.000	4.200	7.000	6.000	15.000	1.200	Zdiff	76.250	Zcommon	19.323	Zodd	38.125	Zeven	38.645

Example #2

In this example we are using the Edge-Coupled Offset Stripline 1B1A structure.

From the structure image we need the following parameters:

H1, Er1, H2, Er2, W1, W2, S1, T1

To illustrate the other CalcType options available we have added columns to contain results for Zdiff, Zcommon, Zodd and Zeven.

The calculated result columns are K (Zdiff), M (Zcommon), O (Zodd) and Q (Zeven).

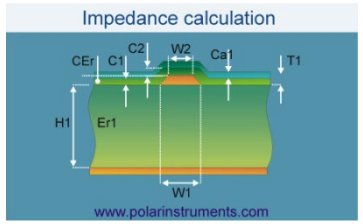
Using the power of Excel graphing we have plotted Separation (S1) against Impedance, with four data series: Zdiff, Zcommon, Zodd and Zeven.

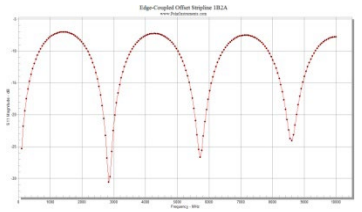
Summary

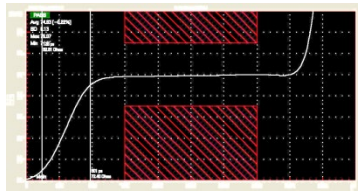
The Si Excel Interface Lossless Controlled Impedance Design System is a comprehensive controlled impedance design aid which provides modelling for a wide variety of structures as a set of functions through a Microsoft® Excel user interface.

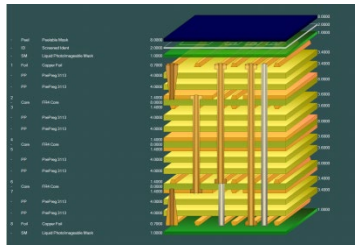
A package of Microsoft® Excel spreadsheets allows direct access to the field solver; you can graph any parameter you choose using the pre-prepared Microsoft® Excel workbooks or build your own workbooks to model your process.

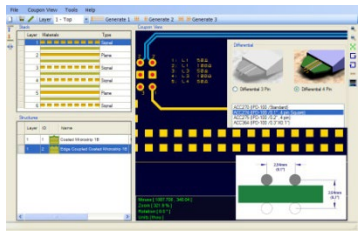
The Si Excel functions included in Excel format enable advanced decision making; adding to the features currently available from the Si8000m / Si9000e Sensitivity Analysis tab, the Si Excel Interface provides access to the lossless field solving functions from within Excel offering an extremely flexible and powerful way to calculate and graph the effects of a range of a parameter value changes.



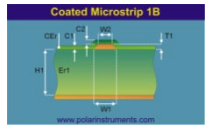


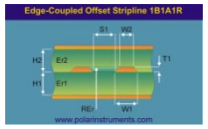


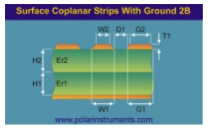


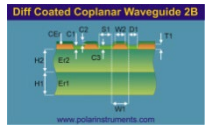


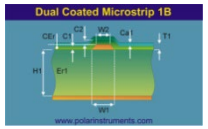
Thank you for viewing this Si Excel Interface 2023 preview.
If you have questions we would be delighted to help you.
Your local contact information is contained on the following slide

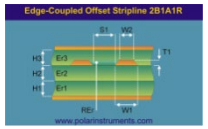


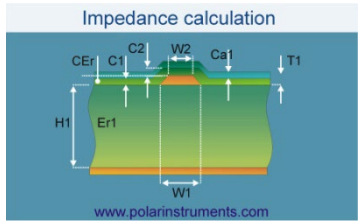


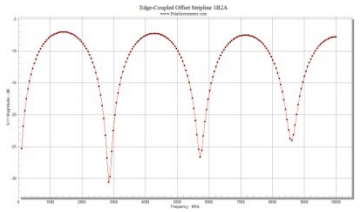


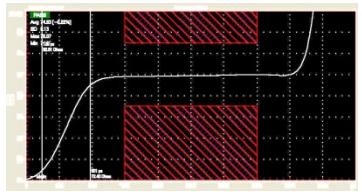


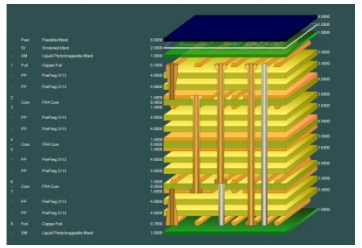


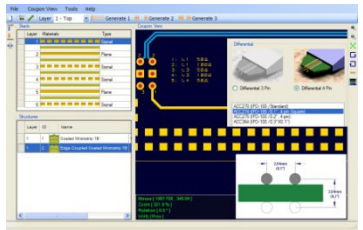












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