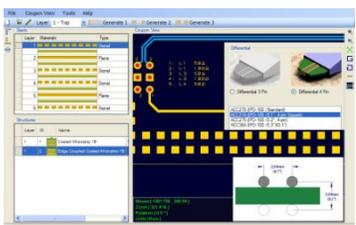
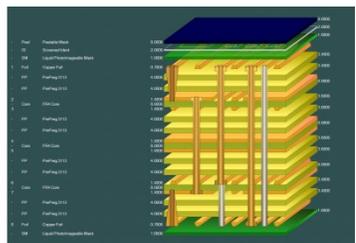
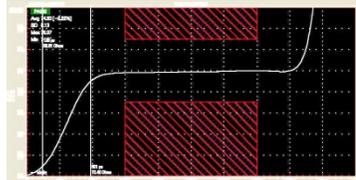
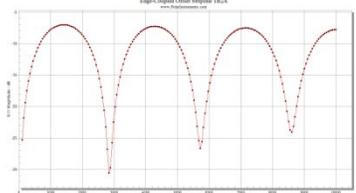
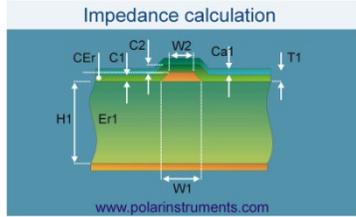




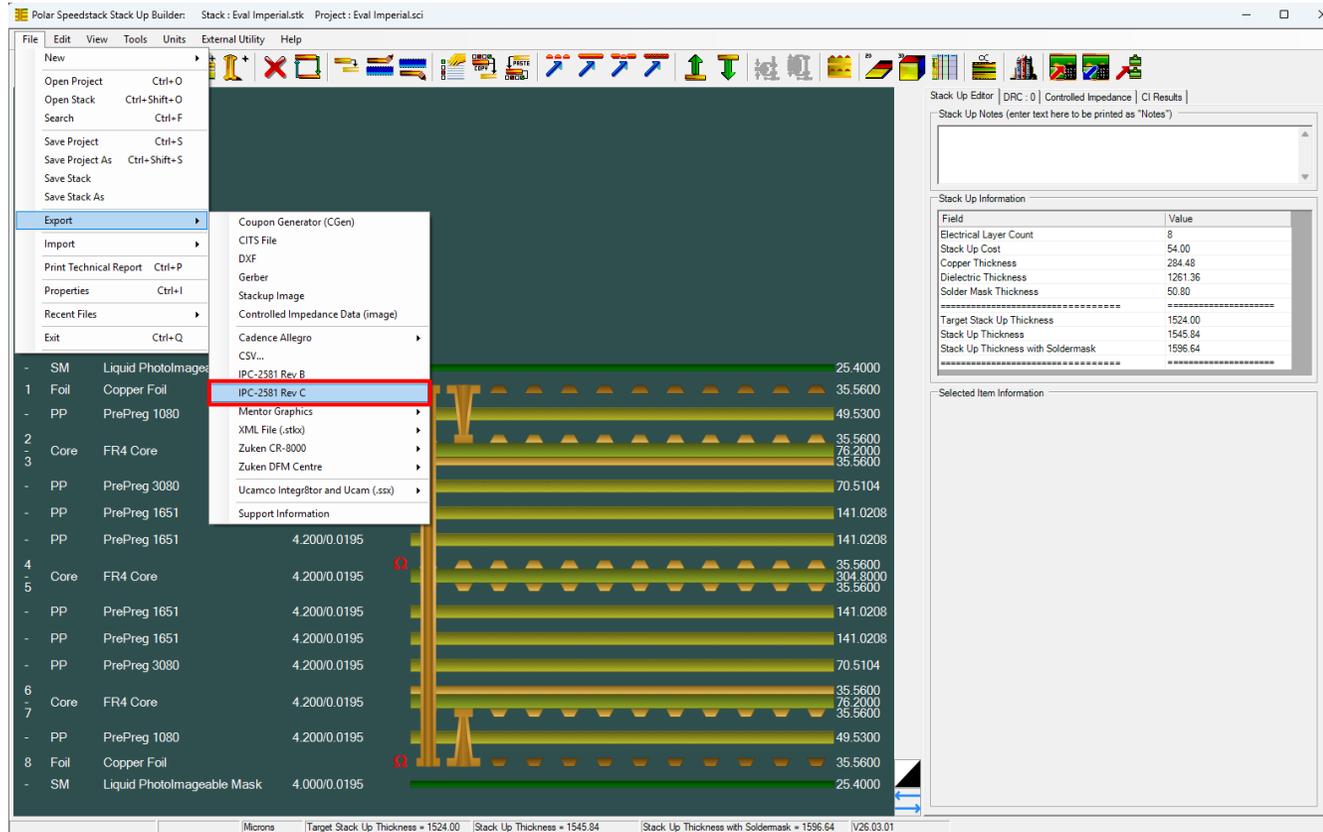
Speedstack 2026 Cumulative Updates

Richard Attrill – March 2026 (Rev 21)

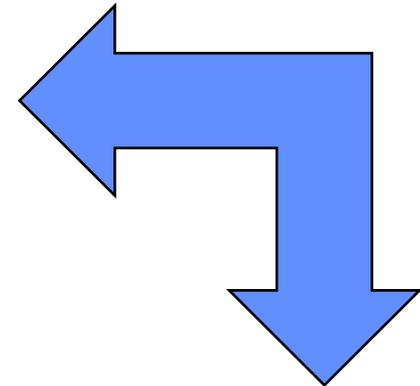


Speedstack v26.03.10 (March 2026)

New File | Import / Export | IPC-2581 Rev C options

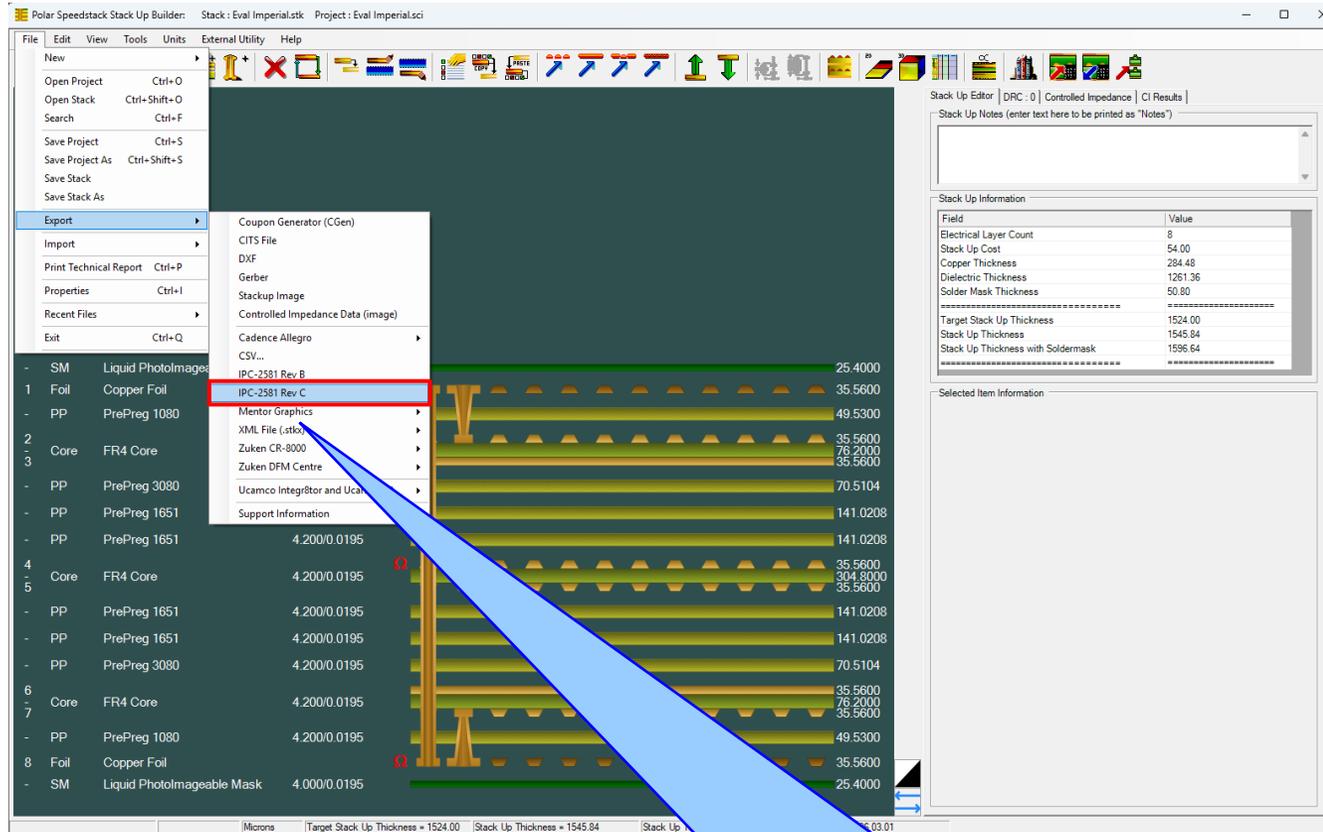


The new import / export IPC-2581 Rev C options allow for the transfer and exchange of stack up information with 3rd party systems that also support this format

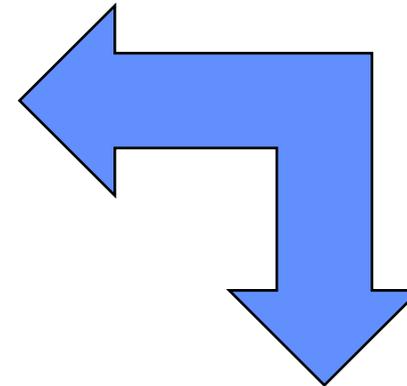


Polar Instruments are a member of the IPC-2581 Consortium

New File | Import / Export | IPC-2581 Rev C options

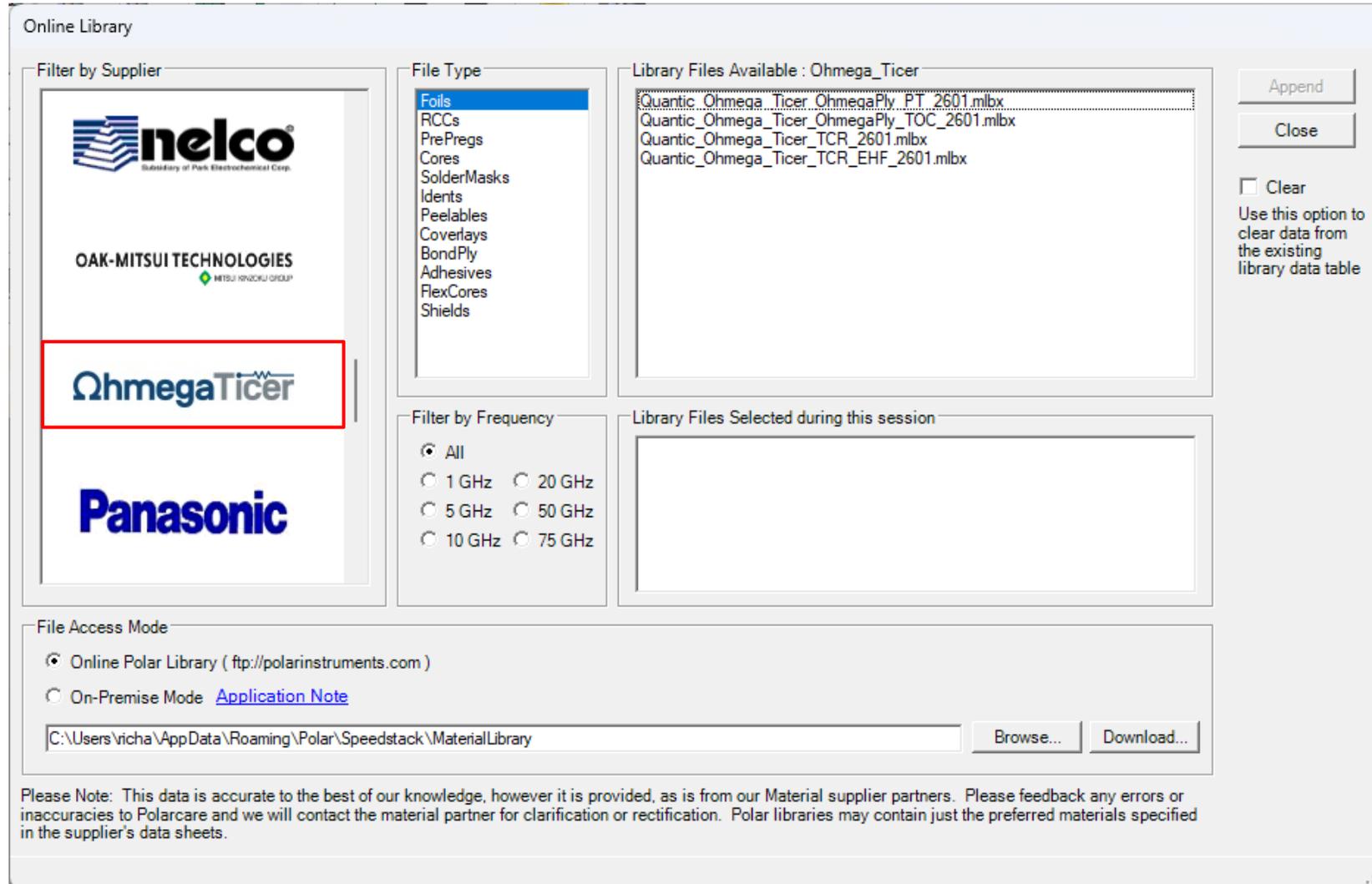


Rev C options allow for the transfer and exchange of stack up information with 3rd party systems that also support this format



Rev B Speedstack output supports one impedance structure per layer – Rev C supports multiple structures per layer.

Ohmega Ticer materials added to the Online Library



The screenshot shows the 'Online Library' interface with the following components:

- Filter by Supplier:** A list of suppliers including Nelco, OAK-MITSUI TECHNOLOGIES, **OhmegaTicer** (highlighted with a red box), and Panasonic.
- File Type:** A list of file types including Foils, RCCs, PrePregs, Cores, SolderMasks, Idents, Peelables, Coverlays, BondPly, Adhesives, FlexCores, and Shields. 'Foils' is selected.
- Library Files Available : Ohmega_Ticer:** A list of files including:
 - Quantic_Ohmega_Ticer_OhmegaPly_PT_2601.mlbx
 - Quantic_Ohmega_Ticer_OhmegaPly_TOC_2601.mlbx
 - Quantic_Ohmega_Ticer_TCR_2601.mlbx
 - Quantic_Ohmega_Ticer_TCR_EHF_2601.mlbx
- Filter by Frequency:** Radio buttons for frequency filters: All (selected), 1 GHz, 20 GHz, 5 GHz, 50 GHz, 10 GHz, and 75 GHz.
- Library Files Selected during this session:** An empty box for tracking selected files.
- File Access Mode:** Radio buttons for 'Online Polar Library (ftp://polarinstruments.com)' (selected) and 'On-Premise Mode [Application Note](#)'. Below is a text field with the path 'C:\Users\richa\AppData\Roaming\Polar\Speedstack\MaterialLibrary' and 'Browse...' and 'Download...' buttons.
- Buttons:** 'Append', 'Close', and 'Clear' (with a checkbox) are located on the right side.
- Clear Note:** 'Use this option to clear data from the existing library data table'.
- Disclaimer:** 'Please Note: This data is accurate to the best of our knowledge, however it is provided, as is from our Material supplier partners. Please feedback any errors or inaccuracies to Polarcare and we will contact the material partner for clarification or rectification. Polar libraries may contain just the preferred materials specified in the supplier's data sheets.'

Enhancements

- FlexNet Publisher / FLEXIm v11.19.9.0 now supported

Speedstack v26.01.02 (Jan 2026)

File | Export | CITS File enhancements

File | Export | CITS File enhancements include improved support for locales that use a comma as the decimal symbol

The screenshot displays the Polar Speedstack software interface. On the left is the 'Stack Up Editor' showing a list of layers with their thicknesses. In the center is a 3D cross-section diagram of a microstrip structure with various parameters labeled (H1, E1, W1, W2, S1, T1, Gr1, C1, G3, V2). On the right is the 'Controlled Impedance Test System' window, which shows a table of test results and a graph of differential impedance over distance.

Description	Layer	Nominal Ohms	Average
Edge Coupled Coated Microstrip 1B	1	100.50	97.02
Coated Microstrip 1B	1	75.80	
Differential Coplanar Strips With Lower Gr...	1	100.70	
Coated Coplanar Strips With Lower Gr...	1	50.80	
Embedded Microstrip 1B1A	2	50.90	

The graph shows 'Differential Impedance' in Ohms on the y-axis (ranging from 60 to 130) and distance in mm on the x-axis (ranging from 0 to 225). A green 'PASS' label is visible on the graph. The graph also indicates 'Prop. Time = 0.83 ns' and 'Delta Time = 1.67 ns'.

Speedstack v26.01.01 (Jan 2026)

New Original Structure Values feature*

The Original Structure Values feature allows for an additional set of parameter values to be stored per structure. This is useful if the design trace widths and separation values need to be adjusted at the fabrication stage to meet the target impedance

A new Original Structure Values toolbar icon has been introduced to the Controlled Impedance tab.

The screenshot shows the software interface with the 'Original Structure Values' dialog box open. The dialog box contains the following parameters:

Original Structure Values	
Original Lower Trace Width	W1: 8.0000
Original Upper Trace Width	W2: 7.0000
Original Trace Separation	S1: 7.7650
Original Lower Ground Strip Width	G1: 0.0000
Original Upper Ground Strip Width	G2: 0.0000
Original Ground Strip Separation	D1: 0.0000

Below the dialog box is a stackup list:

Layer	Material	Thickness	Order
-	SM	Liquid Photolimageable Mask	4.000/0.0195
1	Foil	Copper Foil	1.0000
-	PP	PrePreg 1080	1.4000
-	PP	PrePreg 1080	1.9500
2	Core	FR4 Core	1.4000
3	Core	FR4 Core	1.4000
-	PP	PrePreg 3080	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
4	Core	FR4 Core	4.200/0.0195
5	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
-	PP	PrePreg 3080	4.200/0.0195
6	Core	FR4 Core	4.200/0.0195
7	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
8	Foil	Copper Foil	4.200/0.0195
-	SM	Liquid Photolimageable Mask	4.000/0.0195

The cross-section diagram shows an 'Edge Coupled Coated Microstrip 1B' with parameters: CEr, C1, C2, S1, W2, W1, T1, Er1, H1.

The parameter table below the diagram lists the following values:

Substrate 1 Height	H1	6.3500
Substrate 1 Dielectric	Er1	4.2000
Lower Trace Width	W1	7.6500
Upper Trace Width	W2	6.6500
Trace Separation	S1	8.1150
Trace Thickness	T1	1.4000
Coating Above Substrate	C1	1.0000
Coating Above Trace	C2	1.0000
Coating Between Traces	C3	1.0000
Coating Dielectric	CEr	4.0000
Differential Impedance	Zd	100.29
Target Impedance		100.00
Target Tolerance %		10.00

A new dialog has been introduced where it is possible to set / key in the Original Structure Values for a selected structure

Each structure has six Original Structure Value parameters for W1, W2, S1, G1, G2, D1, if a structure doesn't use some of those parameters they can be left as 0

- Supports commonly used structures: See slide 12

New Original Structure Values feature

Mils

Original Structure Values			
Original Lower Trace Width	W1	<input type="text" value="8.0000"/>	<input type="button" value="Apply"/> <input type="button" value="Cancel"/>
Original Upper Trace Width	W2	<input type="text" value="7.0000"/>	
Original Trace Separation	S1	<input type="text" value="7.7650"/>	
Original Lower Ground Strip Width	G1	<input type="text" value="0.0000"/>	
Original Upper Ground Strip Width	G2	<input type="text" value="0.0000"/>	
Original Ground Strip Separation	D1	<input type="text" value="0.0000"/>	Application Note

The new Original Structure Values feature supports unit switching. This allows for reporting of these parameters in units that match your user / customer preference

Microns

Original Structure Values			
Original Lower Trace Width	W1	<input type="text" value="203.20"/>	<input type="button" value="Apply"/> <input type="button" value="Cancel"/>
Original Upper Trace Width	W2	<input type="text" value="177.80"/>	
Original Trace Separation	S1	<input type="text" value="197.23"/>	
Original Lower Ground Strip Width	G1	<input type="text" value="0.00"/>	
Original Upper Ground Strip Width	G2	<input type="text" value="0.00"/>	
Original Ground Strip Separation	D1	<input type="text" value="0.00"/>	Application Note

New Original Structure Values feature

C:\Apps\Samples\Eval Imperial v26.sci
Units: Mils

Layer	Stack up	Supplier	Description	Type	Processed Thickness	Impedance ID
1		Polar Samples	Liquid PhotoImageable Mask	SolderMask	1.000	
1		Polar Samples	Copper Foil	Copper	1.400	1, 2, 3, 4
1		Polar Samples	PrePreg 1080	Dielectric	1.950	
2					1.400	5, 6, 7
2					3.000	
3		Polar Samples	FR4 Core	FR4	1.400	
3					2.776	
3		Polar Samples	PrePreg 3080	Dielectric	2.776	
3		Polar Samples	PrePreg 1651	Dielectric	5.552	
3		Polar Samples	PrePreg 1651	Dielectric	5.552	
4					1.400	8, 9, 10, 11, 12
4		Polar Samples	FR4 Core	FR4	12.000	
4					1.400	
4					5.552	
4		Polar Samples	PrePreg 1651	Dielectric	5.552	
4		Polar Samples	PrePreg 1651	Dielectric	5.552	
4		Polar Samples	PrePreg 3080	Dielectric	2.776	
5					1.400	
5					3.000	
5		Polar Samples	FR4 Core	FR4	1.400	
5					5.552	
5		Polar Samples	PrePreg 1651	Dielectric	5.552	
5		Polar Samples	PrePreg 3080	Dielectric	2.776	
6					1.400	
6		Polar Samples	FR4 Core	FR4	3.000	
6					1.400	
6					1.950	
6		Polar Samples	PrePreg 1080	Dielectric	1.950	
6		Polar Samples	Copper Foil	Copper	1.400	13
8		Polar Samples	Liquid PhotoImageable Mask	SolderMask	1.000	

The six new Original Structure Value parameters have been introduced to the Controlled Impedance Table on the technical report. The position of the new Original Structure Value columns can be defined by the user

Copper Thickness = 11.200 | Dielectric Thickness = 49.660 | Solder Mask Thickness = 2.000 | Stack Up Thickness = 60.860 | Stack Up Thickness with Solder Mask = 62.860

Notes

Impedance ID	Structure Image	Impedance Signal Layer	Ref. Plane 1 in Layer	Ref. Plane 2 in Layer	Lower Trace Width (W1)	Original Lower Trace Width (W1)	Upper Trace Width (W2)	Original Upper Trace Width (W2)	Trace Separation (S1)	Original Trace Separation (S1)	Lower Ground Strip Width (G1)	Original Lower Ground Strip Width (G1)	Upper Ground Strip Width (G2)	Original Upper Ground Strip Width (G2)	Ground Strip Separation (D1)	Original Ground Strip Separation (D1)	Target Impedance	Tol (+/- %)	Calculated Impedance
1		1	3	0	7.650	8.000	6.650	7.000	8.115	7.765	0.000	0.000	0.000	0.000	0.000	0.000	100.000	10.000	100.290
2		1	3	0	4.000	4.500	3.000	3.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	75.000	10.000	75.800
3		1	3	0	9.313	9.500	8.313	8.500	15.688	15.500	100.000	90.000	99.000	89.000	10.000	15.000	100.000	10.000	99.600

StackName: Master	Version:	Revision:	Modification:	Date of Revision:	Editor:	Page 1/X
Date:	Associated Documents:					
Author:						
Department:						
Site:						

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Other enhancements

- New import / export XML STKX v26.00 and SSX v16.00 file formats to support the new Original Structure Values.
- Please note: This feature has been introduced to the most commonly used structures supported by Speedstack:

Coated Microstrip 1B

Edge-Coupled Coated Microstrip 1B

Coated Coplanar Strips with Ground 1B

Coated Coplanar Waveguide with Ground 1B

Diff Coated Coplanar Strips with Ground 1B

Embedded Microstrip 1B1A

Edge Coupled Embedded Microstrip 1B1A

Edge Coupled Embedded Microstrip 1B1A1R

Offset Stripline 1B1A

Offset Coplanar Stripline 1B1A

Offset Coplanar Waveguide Stripline 1B1A

Edge Coupled Offset Stripline 1B1A

Edge Coupled Offset Stripline 1B1A1R

Diff Offset Coplanar Waveguide 1B1A

Offset Stripline 2B2A

Edge Coupled Offset Stripline 2B2A

Broadside-Coupled Stripline 2S

Speedstack v25.09.01 (Sept 2025)

Enhancements

- Updated to support latest Boundary Element Method (BEM) Calculation Engine v25.07.23

Speedstack v25.05.01 (May 2025)

Advanced Chip & Circuit Materials added to the Online Library

Online Library

Filter by Supplier

All Suppliers



Advanced Chip & Circuit Materials



File Type

- Foils
- RCCs
- PrePreqs**
- Cores
- SolderMasks
- Idents
- Peelables
- Coverlays
- BondPly
- Adhesives
- FlexCores
- Shields

Library Files Available : ACCM

- ACCM_Celeritas_SF_PO1600_10GHz_2505.mlbx
- ACCM_Celeritas_SF_PO1600_20GHz_2505.mlbx
- ACCM_Celeritas_SF_PO1600_2GHz_2505.mlbx
- ACCM_Celeritas_SF_PO1600_40GHz_2505.mlbx
- ACCM_Celeritas_SF_PO1600_5GHz_2505.mlbx
- ACCM_Celeritas_SF_PO400_10GHz_2505.mlbx
- ACCM_Celeritas_SF_PO400_20GHz_2505.mlbx
- ACCM_Celeritas_SF_PO400_2GHz_2505.mlbx
- ACCM_Celeritas_SF_PO400_40GHz_2505.mlbx
- ACCM_Celeritas_SF_PO400_5GHz_2505.mlbx
- ACCM_Celeritas_SF_PO800_10GHz_2505.mlbx
- ACCM_Celeritas_SF_PO800_20GHz_2505.mlbx
- ACCM_Celeritas_SF_PO800_2GHz_2505.mlbx
- ACCM_Celeritas_SF_PO800_40GHz_2505.mlbx
- ACCM_Celeritas_SF_PO800_5GHz_2505.mlbx

Append

Close

Clear

Use this option to clear data from the existing library data table

Filter by Frequency

All

1 GHz 20 GHz

5 GHz 50 GHz

10 GHz 75 GHz

Library Files Selected during this session

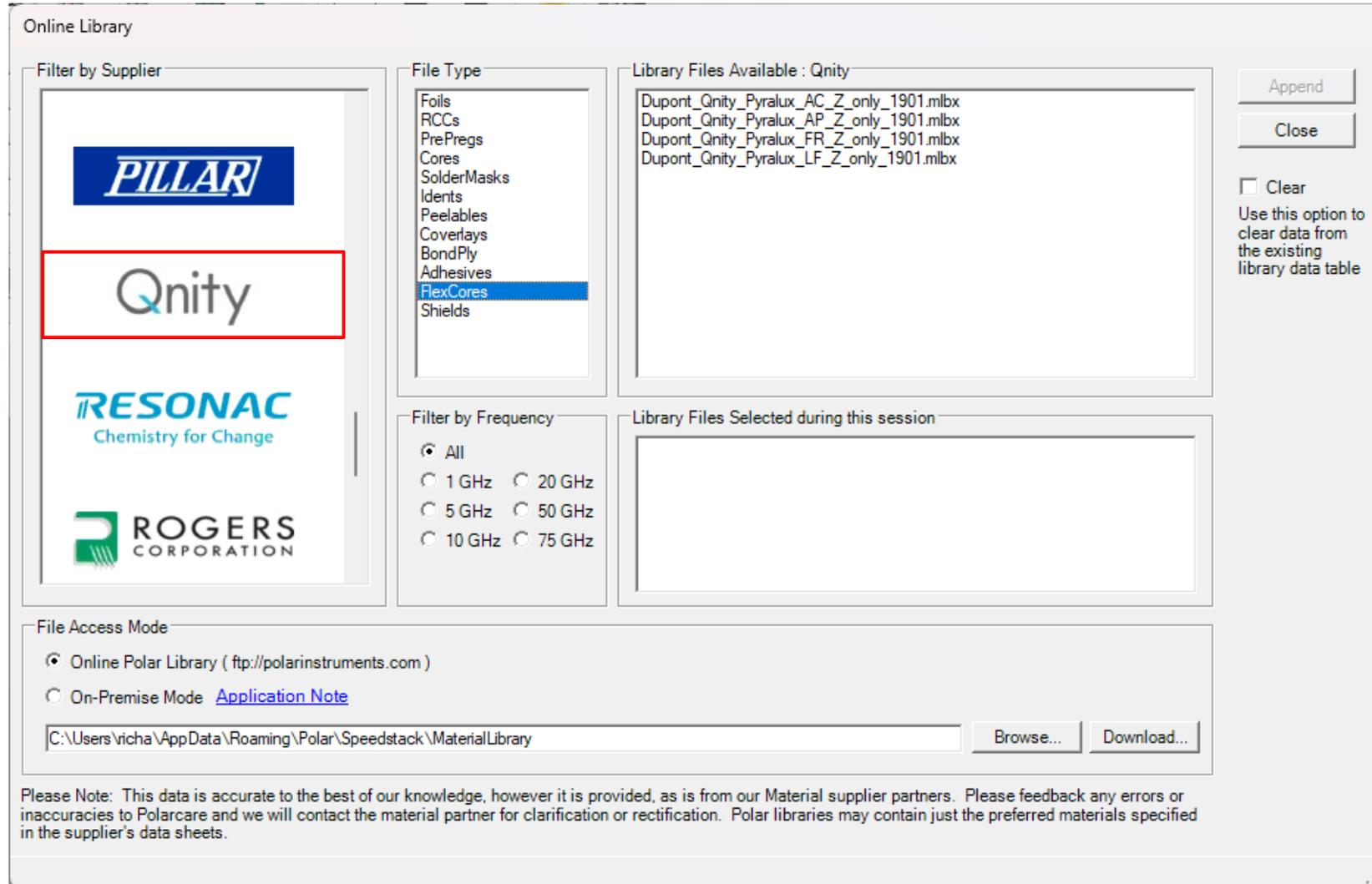
File Access Mode

Online Polar Library (<ftp://polarinstruments.com>)

On-Premise Mode [Application Note](#)

Please Note: This data is accurate to the best of our knowledge, however it is provided, as is from our Material supplier partners. Please feedback any errors or inaccuracies to Polarcare and we will contact the material partner for clarification or rectification. Polar libraries may contain just the preferred materials specified in the supplier's data sheets.

Qnity materials added to the Online Library

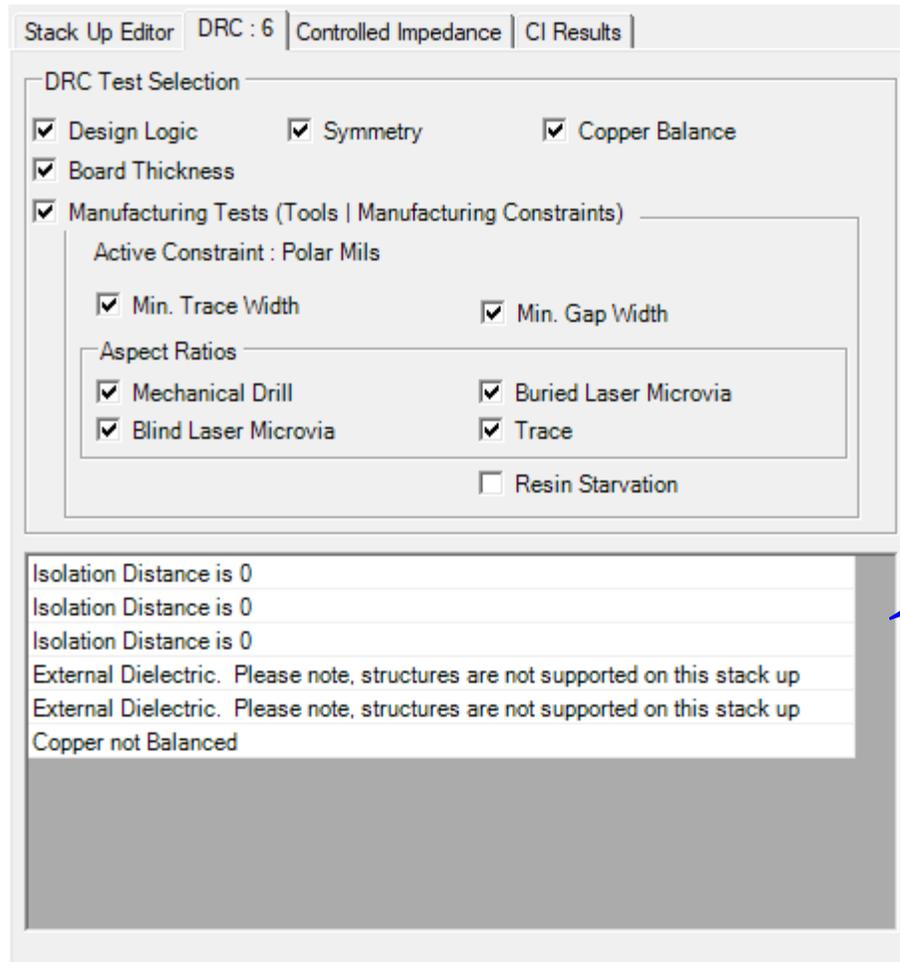


The screenshot shows the 'Online Library' interface with the following components:

- Filter by Supplier:** A list of logos including PILLAR, Qnity (highlighted with a red box), RESONAC, and ROGERS CORPORATION.
- File Type:** A list of material types: Foils, RCCs, PrePregs, Cores, SolderMasks, Idents, Peelables, Coverlays, BondPly, Adhesives, FlexCores (highlighted in blue), and Shields.
- Library Files Available : Qnity:** A list of files: Dupont_Qnity_Pyralux_AC_Z_only_1901.mlbx, Dupont_Qnity_Pyralux_AP_Z_only_1901.mlbx, Dupont_Qnity_Pyralux_FR_Z_only_1901.mlbx, and Dupont_Qnity_Pyralux_LF_Z_only_1901.mlbx.
- Filter by Frequency:** Radio buttons for All (selected), 1 GHz, 5 GHz, 10 GHz, 20 GHz, 50 GHz, and 75 GHz.
- File Access Mode:** Radio buttons for Online Polar Library (ftp://polarinstruments.com) (selected) and On-Premise Mode (Application Note).
- File Path:** A text box containing 'C:\Users\richa\AppData\Roaming\Polar\Speedstack\MaterialLibrary' with 'Browse...' and 'Download...' buttons.
- Buttons:** 'Append', 'Close', and 'Clear' buttons are located on the right side.
- Text:** 'Use this option to clear data from the existing library data table' is located below the 'Clear' button.
- Footer:** A 'Please Note' section at the bottom of the window.

Speedstack v25.01.01 (Jan 2025)

Design Rule Checks (DRC) now include more informative messages



The Design Rule Check messages have been enhanced. These new messages offer improved guidance to the user

Structure View enhancements

Structure View now support coplanar without ground structures and offset stripline structures where one reference plane is hatched

Stack Up Editor | DRC : 0 | Controlled Impedance | CI Results

Coated Coplanar Strips 1B

Substrate 1 Height	H1	9.7000
Substrate 1 Dielectric	Er1	4.2000
Lower Trace Width	W1	17.7500
Upper Trace Width	W2	16.7500
Lower Ground Strip Width	G1	100.0000
Upper Ground Strip Width	G2	99.0000
Ground Strip Separation	D1	10.0000
Trace Thickness	T1	1.4000
Coating Above Substrate	C1	1.0000
Coating Above Trace	C2	1.0000
Coating Between Traces	C3	1.0000
Coating Dielectric	CEr	4.0000

Impedance		Zo	75.09
Target Impedance			75.00
Target Tolerance %			10.00

Displaying 2 structures on All Layers

Layer	Target Zo	Structure	Zo	W1/W2	Zo	G1/G2	D1	W1/W2	D1	G1/G2
1	50	Single-Ended	49.61	1.7031 / 2.7031	75.09	99.0000 / 100.0000	10.0000	16.7500 / 17.7500	10.0000	99.0000 / 100.0000
2	75	Single Ended Coplanar Strips								

Mils/Thous | Target Stack Up Thickness = 60.0000 | Stack Up Thickness = 12.5000 | Stack Up Thickness with Soldermask = 14.5000 | V25.01.01

Full list of enhancements & fixes included with v25.01.01

1. Printing: The Solder Mask to Solder Mask dimension arrow now detects when only a single Solder Mask exists and suppresses the dimension arrow when the stack up spans two or more pages
2. Drilling: When adding a drill to a stack that contains just prepregs and no copper layers an exception error was displayed. This is now resolved
3. DRC: The 'Stack is impossible to build' message was rather vague. Now replaced with the more informative 'Isolation Distance is 0' message
4. DRC: The 'External Dielectrics' message now replaced with 'External Dielectric. Please note, structures are not supported on this stack up' message
5. Messaging: More detail added to the messaging when Speedstack is unable to add structures to stack up - 001-00-000965

Full list of enhancements & fixes included with v25.01.01

6. Messaging: When the stack up is modified after structures have been added a 'No Valid Mnemonic' message is sometimes displayed. A more detailed explanation of how to resolve the issue is now provided
7. Structure View Graphics: Fixed problem where inverted offset structures when using one hatched plane, shows the hatched plane in wrong position. This is now resolved
8. Structure View Graphics: When a coplanar without ground is added Structure View will not display. This is now resolved
9. Controlled Impedance Toolbar. When adding the first structure to a sub-stack with mini-stacks or air gaps in the sub-stack the toolbar is disabled. This is now resolved
10. Mini Stacks with Air Gaps: Display a warning message, when adding structures, that those types of stack up are not supported by the Simple Percentage Method finishing method

Speedstack v24.09.01 (Sept 2024)

New Back Drill Types – Pointed, Flat and Router

It is now possible to specify the Back Drill Type. A Pointed, Flat or Router drill type may now be added to the stack up.

Field	Value
Electrical Layer Count	8
Stack Up Cost	54.00
Copper Thickness	11.2000
Dielectric Thickness	49.6600
Solder Mask Thickness	2.0000
=====	
Target Stack Up Thickness	60.0000
Stack Up Thickness	60.8600
Stack Up Thickness with Soldermask	62.8600
=====	

Layer	Material	Thickness (Mils/Thous)	Order
-	SM	Liquid Photolimageable Mask	4.000/0.0195
1	Foil	Copper Foil	1.4000
-	PP	PrePreg 1080	4.200/0.0195
2	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 3080	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
4	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
-	PP	PrePreg 3080	4.200/0.0195
6	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
8	Foil	Copper Foil	1.4000
-	SM	Liquid Photolimageable Mask	4.000/0.0195

Target Stack Up Thickness = 60.0000 | Stack Up Thickness = 60.8600 | Thickness with Soldermask = 62.8600 | Beta V24.09.100

New Back Drill Types – Pointed, Flat and Router

Specify the Back Drill Type in the Add Drill or Drill Properties dialog

The image shows a 'Drill Properties' dialog box with three instances of the 'Back Drill Information' section. Each instance has a 'Back Drill Type' dropdown menu highlighted with a red box. The first instance is set to 'Pointed', the second to 'Flat', and the third to 'Router'. Blue callout boxes point to each dropdown with the corresponding label. A larger blue callout box at the top right points to the overall dialog area with the text 'Specify the Back Drill Type in the Add Drill or Drill Properties dialog'. The dialog also includes sections for 'Electrical Layers', 'Drill Information', and 'Hole Information'.

New Back Drill Types – Pointed, Flat and Router

C:\Apps\Samples\Eval Imperial v25 Back Drill Types.sci Units: Mils

Layer	Supplier	Description	Type	Processed Thickness	er	Loss Tangent	Impedance ID
1	Polar Samples	Liquid Photolimageable Mask	SolderMask	1.000	4.000	0.0195	
1	Polar Samples	Copper Foil	Copper	1.400			1, 2
2	Polar Samples	PrePreg 1080	Dielectric	1.950	4.200	0.0195	
3	Polar Samples	FR4 Core	FR4	3.000	4.200	0.0195	
3	Polar Samples	FR4 Core	FR4	1.400			
4	Polar Samples	PrePreg 3080	Dielectric	2.776	4.200	0.0195	
4	Polar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
5	Polar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
5	Polar Samples	FR4 Core	FR4	1.400			3
5	Polar Samples	FR4 Core	FR4	12.000	4.200	0.0195	
5	Polar Samples	FR4 Core	FR4	1.400			
6	Polar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
6	Polar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
6	Polar Samples	PrePreg 3080	Dielectric	2.776	4.200	0.0195	
7	Polar Samples	FR4 Core	FR4	1.400			
7	Polar Samples	FR4 Core	FR4	3.000	4.200	0.0195	
7	Polar Samples	FR4 Core	FR4	1.400			
8	Polar Samples	PrePreg 1080	Dielectric	1.950	4.200	0.0195	
8	Polar Samples	Copper Foil	Copper	1.400			4
8	Polar Samples	Liquid Photolimageable Mask	SolderMask	1.000	4.000	0.0195	

Copper Thickness = 11.200 | Dielectric Thickness = 49.660 | Solder Mask Thickness = 2.000 |
 Stack Up Thickness = 60.860 | Stack Up Thickness with Soldermask = 62.860

Impedance ID	Structure Image	Structure Name	Impedance Signal Layer	Ref. Plane 1 in Layer	Ref. Plane 2 in Layer	7.250	6.250	8.500	100.000	10.000	101.280
1		Edge Coupled Coated Microstrip 1B	1	3	0						
2		Coated Microstrip 1B	1	3	0						
3		Edge Coupled Offset Stripline 1B1A	4	3	6	7.250	6.250	8.500	100.000	10.000	101.280

The technical report has been updated to support the new Back Drill Types

StackName: Master	Version:	Revision:	Modification:	Date of Revision:	Editor:	Page 1/X
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New Back Drill Types – Pointed, Flat and Router

C:\Apps\Samples\Eval Imperial v25 Back Drill Types.sci Units: Mils



Impedance ID	Structure Image	Structure Name	Impedance Signal Layer	Ref. Plane 1 in Layer	Ref. Plane 2 in Layer	Lower Trace Width (W1)	Upper Trace Width (W2)	Trace Separation (S1)	Target Impedance	Tol (+/- %)	Calculated Impedance
4		Coated Microstrip 1B	8	6	0	4.000	3.000	0.000	75.000	10.000	75.800

Drill Image	Column Position	Drill Type	1st Layer	2nd Layer	Must-Cut Layer No	Must-Not-Cut Layer No	Calculated Drill Depth - Mechanical	Calculated Drill Depth - Laser	Calculated Drill Depth - Back Drill Must-Cut	Calculated Drill Depth - Back Drill Must-Not-Cut
	2	Laser PTH	1	2	-	-	0.000	3.350	0.000	0.000
	4	Back Drill	1	-	3	4	0.000	0.000	9.150	24.430
	6	Back Drill	1	-	3	4	0.000	0.000	9.150	24.430
	8	Back Drill	1	-	3	4	0.000	0.000	9.150	24.430
	1	Mechanical PTH	1	8	-	-	60.860	0.000	0.000	0.000
	6	Back Drill	8	-	6	5	0.000	0.000	9.150	24.430
	8	Back Drill	8	-	6	5	0.000	0.000	9.150	24.430
	4	Back Drill	8	-	6	5	0.000	0.000	9.150	24.430
	2	Laser PTH	8	7	-	-	0.000	3.350	0.000	0.000

The technical report has been updated to support the new Back Drill Types

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New capping options for Back Drills

The screenshot shows the Polar Speedstack Stack Up Builder interface. The main window displays a detailed cross-section of a PCB stack-up with various layers and back-drilled holes. A blue callout box points to the top and bottom of the back-drilled holes, indicating that capping options are now available for these features.

Stack Up Information Table:

Field	Value
Electrical Layer Count	8
Stack Up Cost	54.00
Copper Thickness	11.2000
Dielectric Thickness	49.6600
Solder Mask Thickness	2.0000
-----	-----
Target Stack Up Thickness	60.0000
Stack Up Thickness	60.8600
Stack Up Thickness with Soldermask	62.8600
-----	-----

Selected Item Information:

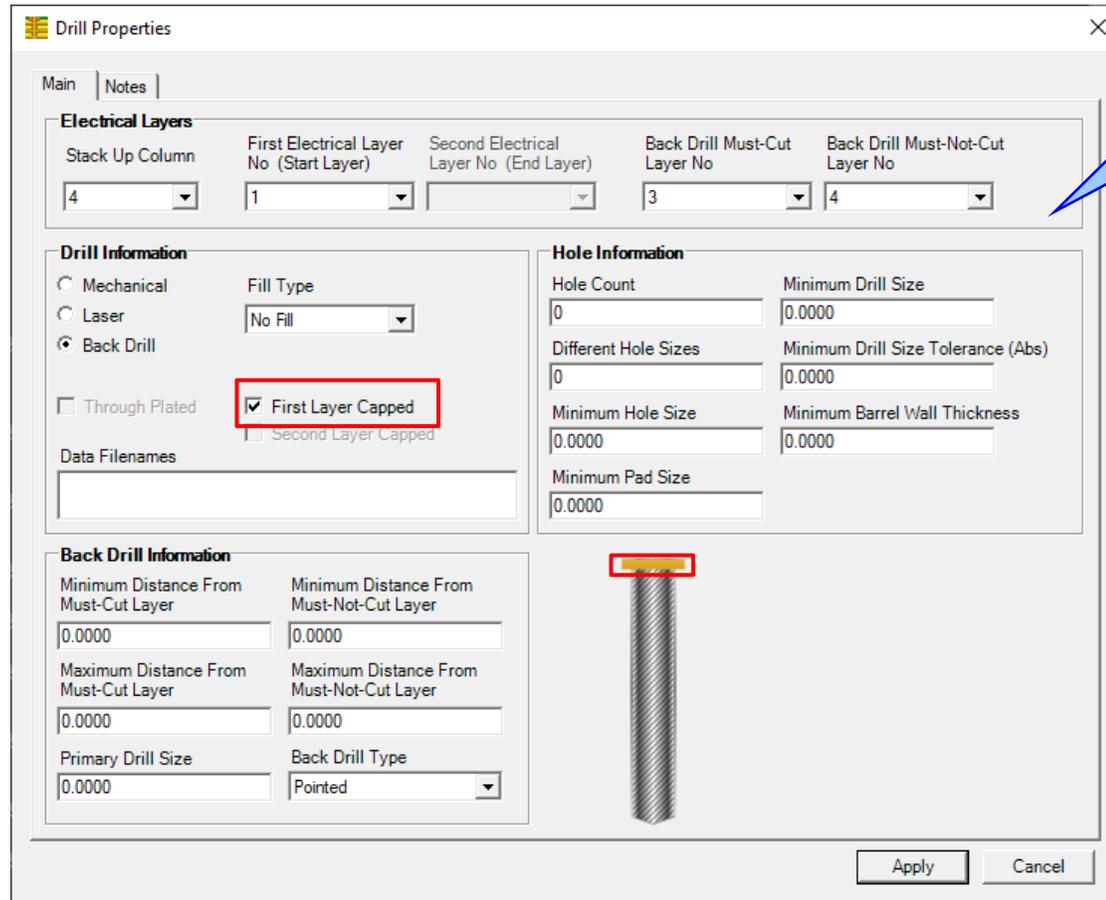
(This section is currently empty in the screenshot.)

Stack Up Details (Left Panel):

Layer	Material	Thickness (Mils/Thous)	Position
-	SM	Liquid Photolimageable Mask	4.000/0.0195
1	Foil	Copper Foil	1.4000
-	PP	PrePreg 1080	4.200/0.0195
2	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 3080	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
4	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
-	PP	PrePreg 3080	4.200/0.0195
6	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
8	Foil	Copper Foil	1.4000
-	SM	Liquid Photolimageable Mask	4.000/0.0195

Status Bar: Mils/Thous | Target Stack Up Thickness = 60.0000 | Stack Up Thickness = 60.8600 | Stack Up Thickness with Soldermask = 62.8600 | Beta V24.09.100

New capping options for Back Drills



The screenshot shows the 'Drill Properties' dialog box with the following settings:

- Electrical Layers:** Stack Up Column: 4, First Electrical Layer No (Start Layer): 1, Second Electrical Layer No (End Layer): (empty), Back Drill Must-Cut Layer No: 3, Back Drill Must-Not-Cut Layer No: 4.
- Drill Information:** Mechanical (unselected), Laser (unselected), Back Drill (selected). Fill Type: No Fill. **First Layer Capped** (checked and highlighted in red), Second Layer Capped (unchecked).
- Back Drill Information:** Minimum Distance From Must-Cut Layer: 0.0000, Minimum Distance From Must-Not-Cut Layer: 0.0000, Maximum Distance From Must-Cut Layer: 0.0000, Maximum Distance From Must-Not-Cut Layer: 0.0000, Primary Drill Size: 0.0000, Back Drill Type: Pointed.
- Hole Information:** Hole Count: 0, Minimum Drill Size: 0.0000, Different Hole Sizes: 0, Minimum Drill Size Tolerance (Abs): 0.0000, Minimum Hole Size: 0.0000, Minimum Barrel Wall Thickness: 0.0000, Minimum Pad Size: 0.0000.

A 3D model of a drill bit is shown at the bottom center, with a red box highlighting the back-drilled section.

Specify the Back Drill capping within the Add Drill or Drill Properties dialog

New capping options for Back Drills

C:\Apps\Samples\Eval Imperial v25 Back Drill Types.sci
Units: Mils

Layer	Supplier	Description	Type	Processed Thickness	cr	Loss Tangent	Impedance ID
1	Polar Samples	Liquid Photolamegeable Mask	SolderMask	1.000	4.000	0.0195	
1	Polar Samples	Copper Foil	Copper	1.400			1, 2
2	Polar Samples	PrePreg 1080	Dielectric	1.950	4.200	0.0195	
3	Polar Samples	FR4 Core	FR4	3.000	4.200	0.0195	
3				1.400			
4	Polar Samples	PrePreg 3080	Dielectric	2.776	4.200	0.0195	
4	Polar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
4	Polar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
5	Polar Samples	FR4 Core	FR4	12.000	4.200	0.0195	3
5				1.400			
6	Polar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
6	Polar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
6	Polar Samples	PrePreg 3080	Dielectric	2.776	4.200	0.0195	
6				1.400			
7	Polar Samples	FR4 Core	FR4	3.000	4.200	0.0195	
7				1.400			
8	Polar Samples	PrePreg 1080	Dielectric	1.950	4.200	0.0195	
8	Polar Samples	Copper Foil	Copper	1.400			4
8	Polar Samples	Liquid Photolamegeable Mask	SolderMask	1.000	4.000	0.0195	

Copper Thickness = 11.200 | Dielectric Thickness = 49.660 | Solder Mask Thickness = 2.000 | 1.860

Impedance ID	Structure Image	Structure Name	Impedance Signal Layer	Ref. Plane 1 in Layer	Ref. Plane 2 in Layer	6	7.250	6.250	8.500	100.000	10.000	101.280
1		Edge Coupled Coated Microstrip 1B	1	3								
2		Coated Microstrip 1B	1	3								
3		Edge Coupled Offset Stripline 1B1A	4	3								

The technical report has been updated to support the new Back Drill capping options

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Grid View now supports Copper Coverage Percentage

Grid View

Stack Up Collection Index	Material Class	Material Element	Electrical Layer	Material Layer Type ID	Layer Name	Description	Processed Thickness	Dielectric Constant	Loss Tangent	Copper Coverage %
0	CSTSolderMask	Mask		SM		Liquid PhotoImageable Mask	1.0000	4.0000	0.0195	
1	CSTFoil	Copper	1	Foil	Top	Copp				10.00
2	CSTPrePreg	Dielectric		PP		PreP		0.0000	0.0195	
3	CSTCore	UpperCopper	2		Inner 2					15.00
3	CSTCore	Dielectric		Core		FR4		0.0000	0.0195	
3	CSTCore	LowerCopper	3		Inner 3					85.00
4	CSTPrePreg	Dielectric		PP		PreP		0.0000	0.0195	
5	CSTPrePreg	Dielectric		PP		PreP		0.0000	0.0195	
6	CSTPrePreg	Dielectric		PP		PreP		0.0000	0.0195	
7	CSTCore	UpperCopper	4		Inner 4					12.00
7	CSTCore	Dielectric		Core		FR4		0.0000	0.0195	
7	CSTCore	LowerCopper	5		Inner 5					12.00
8	CSTPrePreg	Dielectric		PP		PreP		0.0000	0.0195	
9	CSTPrePreg	Dielectric		PP		PreP		0.0000	0.0195	
10	CSTPrePreg	Dielectric		PP		PreP		0.0000	0.0195	
11	CSTCore	UpperCopper	6		Inner 6					90.00
11	CSTCore	Dielectric		Core		FR4 Core	3.0000	4.2000	0.0195	
11	CSTCore	LowerCopper	7		Inner 7		1.4000			18.00
12	CSTPrePreg	Dielectric		PP		PrePreg 1080	1.9500	4.2000	0.0195	
13	CSTFoil	Copper	8	Foil	Bottom	Copper Foil	1.4000			8.00
14	CSTSolderMask	Mask		SM		Liquid PhotoImageable Mask	1.0000	4.0000	0.0195	

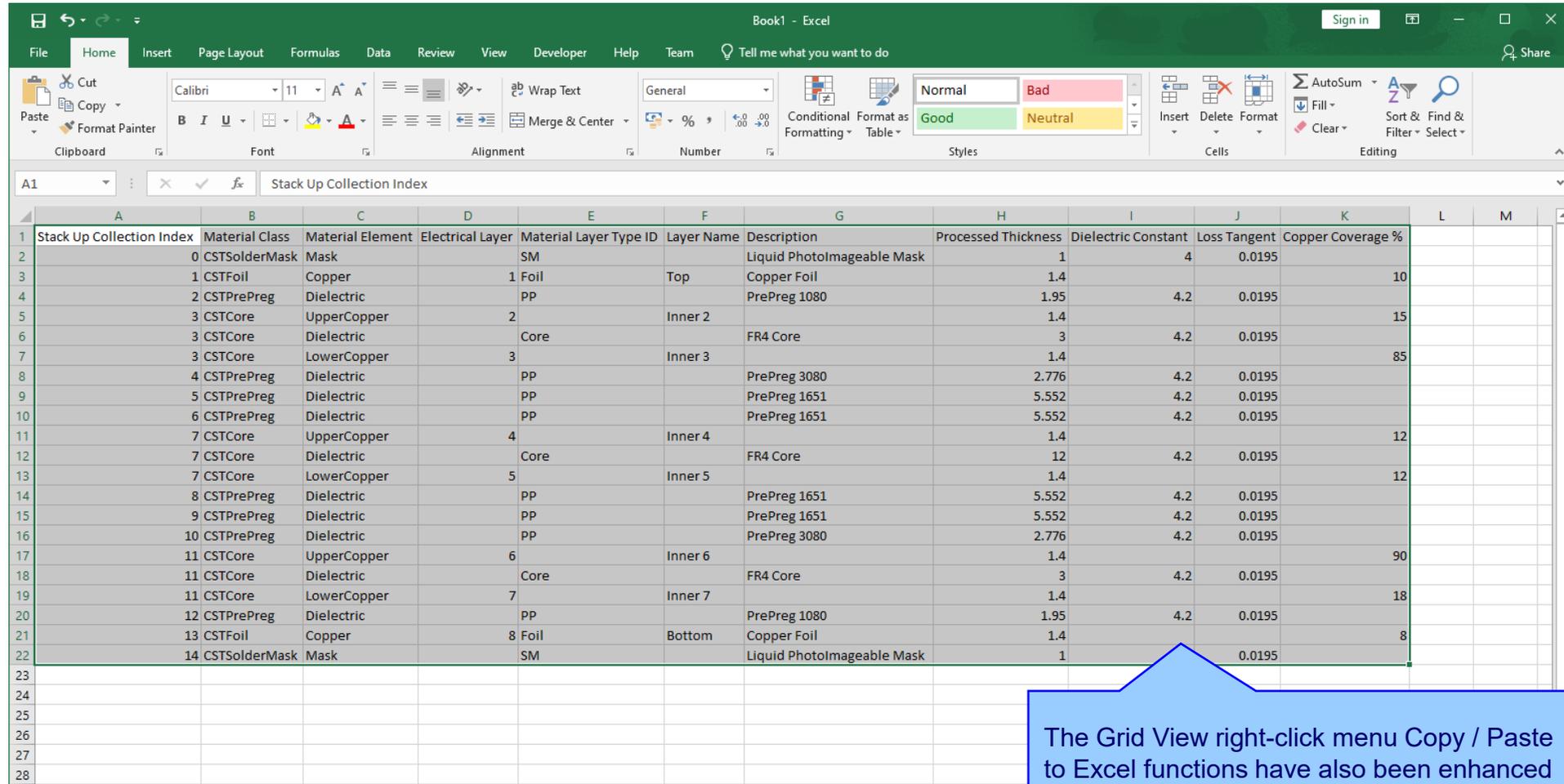
Use the right-click menu to copy / paste the Grid View to the clipboard - the data may then be edited with Microsoft Excel
 Layer Name, Description, Processed Thickness, Dielectric Constant, Loss Tangent and Copper Coverage % columns are editable, other columns are read-only
 Processed Thickness = Copper.FinishedThickness, Dielectric.IsolationDistance, SolderMask.MaskThickness, Coverlay.FinishedThickness

Apply Cancel

The Grid View now supports an additional Copper Coverage Percentage column.

This provides a convenient and quicker way to key in the Copper Coverage for each electrical layer on the stack up. Individual layers may still be edited from the Properties dialog but having a single dialog where all layers are accessible speeds the data entry process significantly

Grid View now supports Copper Coverage Percentage



	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Stack Up Collection Index	Material Class	Material Element	Electrical Layer	Material Layer Type ID	Layer Name	Description	Processed Thickness	Dielectric Constant	Loss Tangent	Copper Coverage %		
2		0 CSTSolderMask	Mask		SM		Liquid PhotoImageable Mask	1		4	0.0195		
3		1 CSTFoil	Copper	1	Foil	Top	Copper Foil	1.4			10		
4		2 CSTPrePreg	Dielectric		PP		PrePreg 1080	1.95		4.2	0.0195		
5		3 CSTCore	UpperCopper	2		Inner 2		1.4			15		
6		3 CSTCore	Dielectric		Core		FR4 Core	3		4.2	0.0195		
7		3 CSTCore	LowerCopper	3		Inner 3		1.4			85		
8		4 CSTPrePreg	Dielectric		PP		PrePreg 3080	2.776		4.2	0.0195		
9		5 CSTPrePreg	Dielectric		PP		PrePreg 1651	5.552		4.2	0.0195		
10		6 CSTPrePreg	Dielectric		PP		PrePreg 1651	5.552		4.2	0.0195		
11		7 CSTCore	UpperCopper	4		Inner 4		1.4			12		
12		7 CSTCore	Dielectric		Core		FR4 Core	12		4.2	0.0195		
13		7 CSTCore	LowerCopper	5		Inner 5		1.4			12		
14		8 CSTPrePreg	Dielectric		PP		PrePreg 1651	5.552		4.2	0.0195		
15		9 CSTPrePreg	Dielectric		PP		PrePreg 1651	5.552		4.2	0.0195		
16		10 CSTPrePreg	Dielectric		PP		PrePreg 3080	2.776		4.2	0.0195		
17		11 CSTCore	UpperCopper	6		Inner 6		1.4			90		
18		11 CSTCore	Dielectric		Core		FR4 Core	3		4.2	0.0195		
19		11 CSTCore	LowerCopper	7		Inner 7		1.4			18		
20		12 CSTPrePreg	Dielectric		PP		PrePreg 1080	1.95		4.2	0.0195		
21		13 CSTFoil	Copper	8	Foil	Bottom	Copper Foil	1.4			8		
22		14 CSTSolderMask	Mask		SM		Liquid PhotoImageable Mask	1		0.0195			
23													
24													
25													
26													
27													
28													

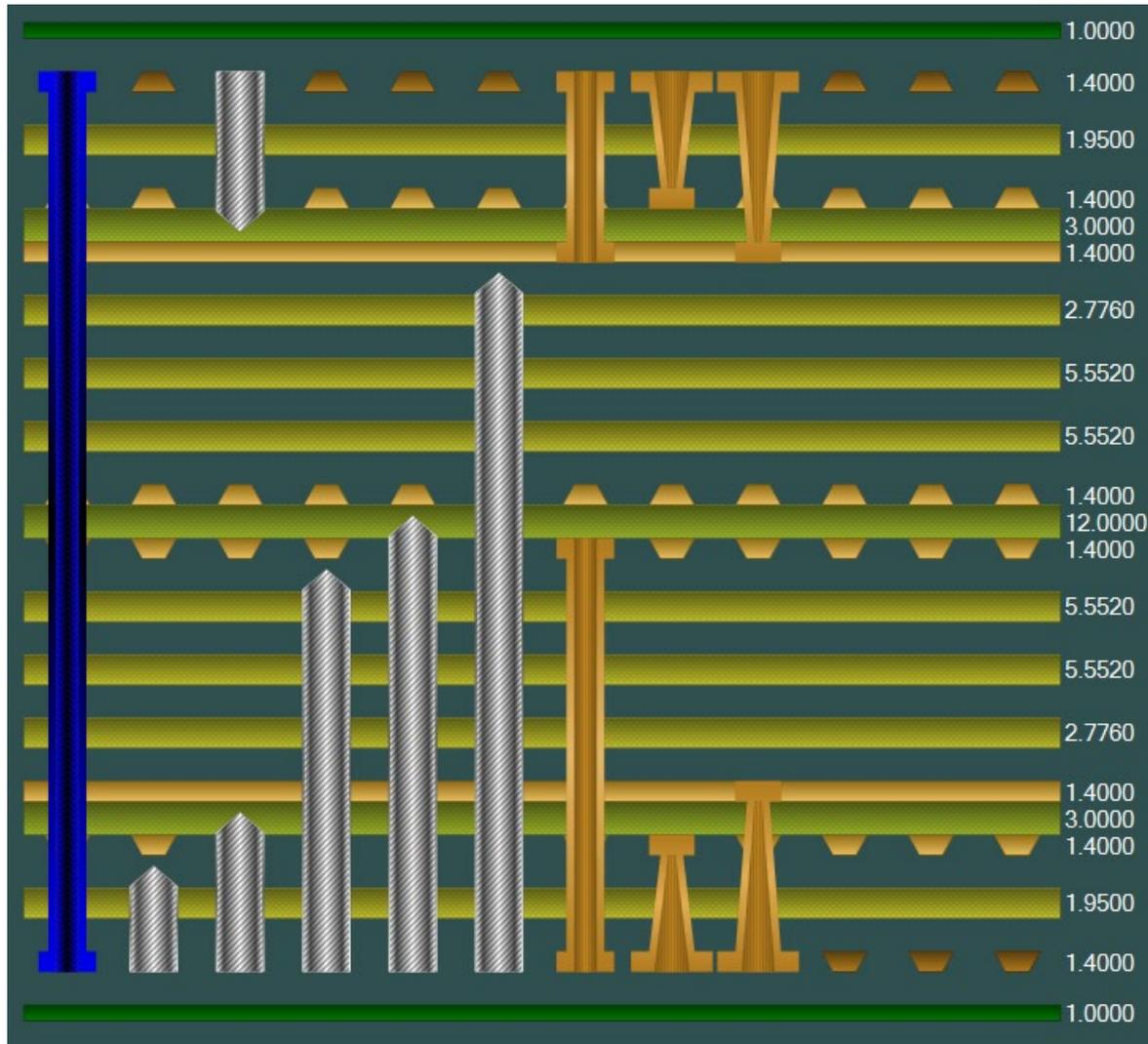
The Grid View right-click menu Copy / Paste to Excel functions have also been enhanced to support Copper Coverage Percentage

Other enhancements

- New import / export XML STKX v25.00 and SSX v15.00 file formats to support the new Back Drill Type and Capped Drill options.
- Drilling: When the Add Drill and Drill Properties dialogs are dismissed the current pan position is now retained. Previously, on high layer stack ups, the graphical image panned to the top of the stack up.
- Printing: The Isolation Distance (Summed) column calculation has been improved to offer better support when the stack up contains single-sided cores.

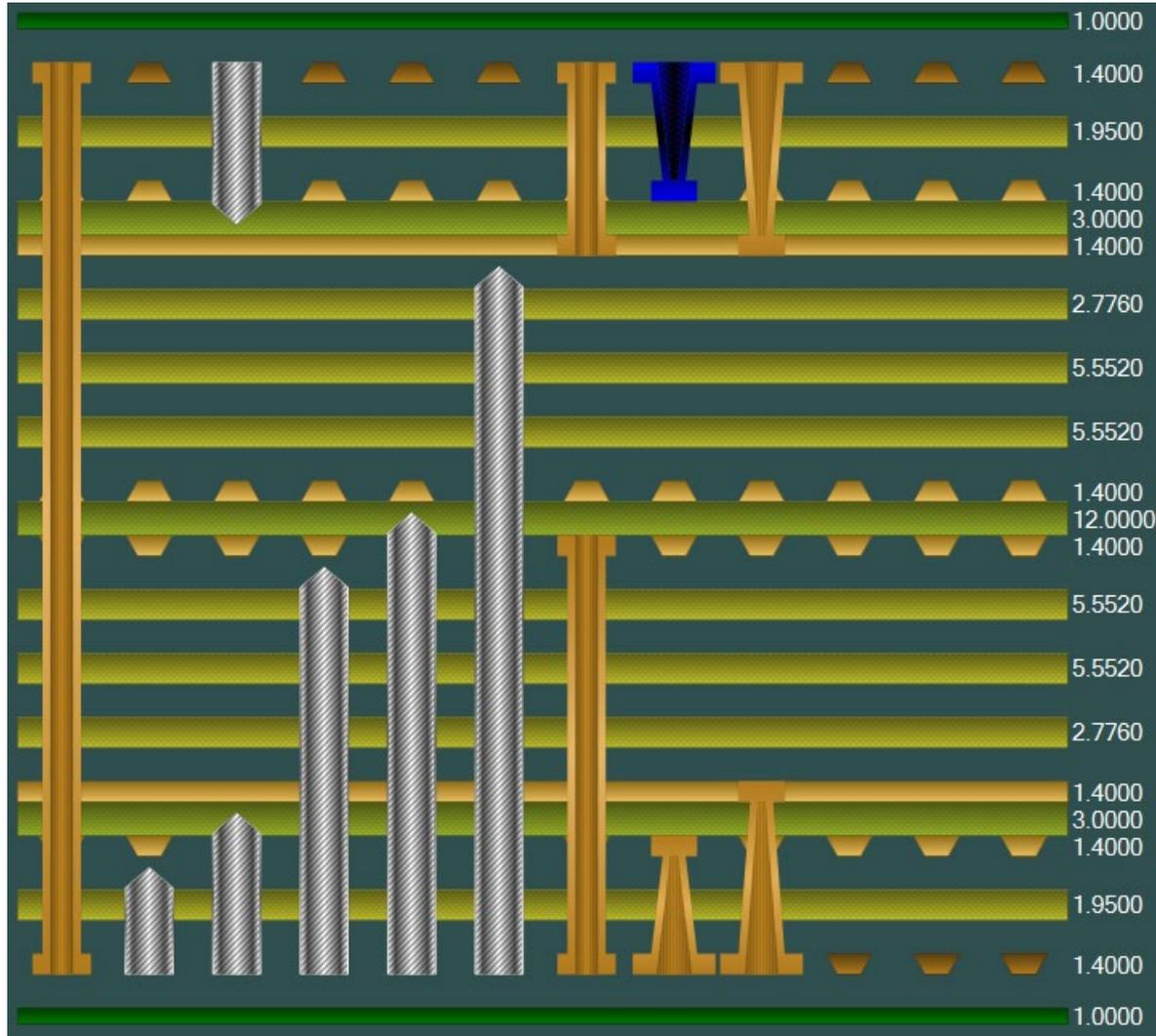
Speedstack v24.05.01 (May 2024)

New Calculated Drill Depth – Mechanical Drills



Calculated Drill Depth – Mechanical Drills.
This includes both the first and second copper layer thicknesses

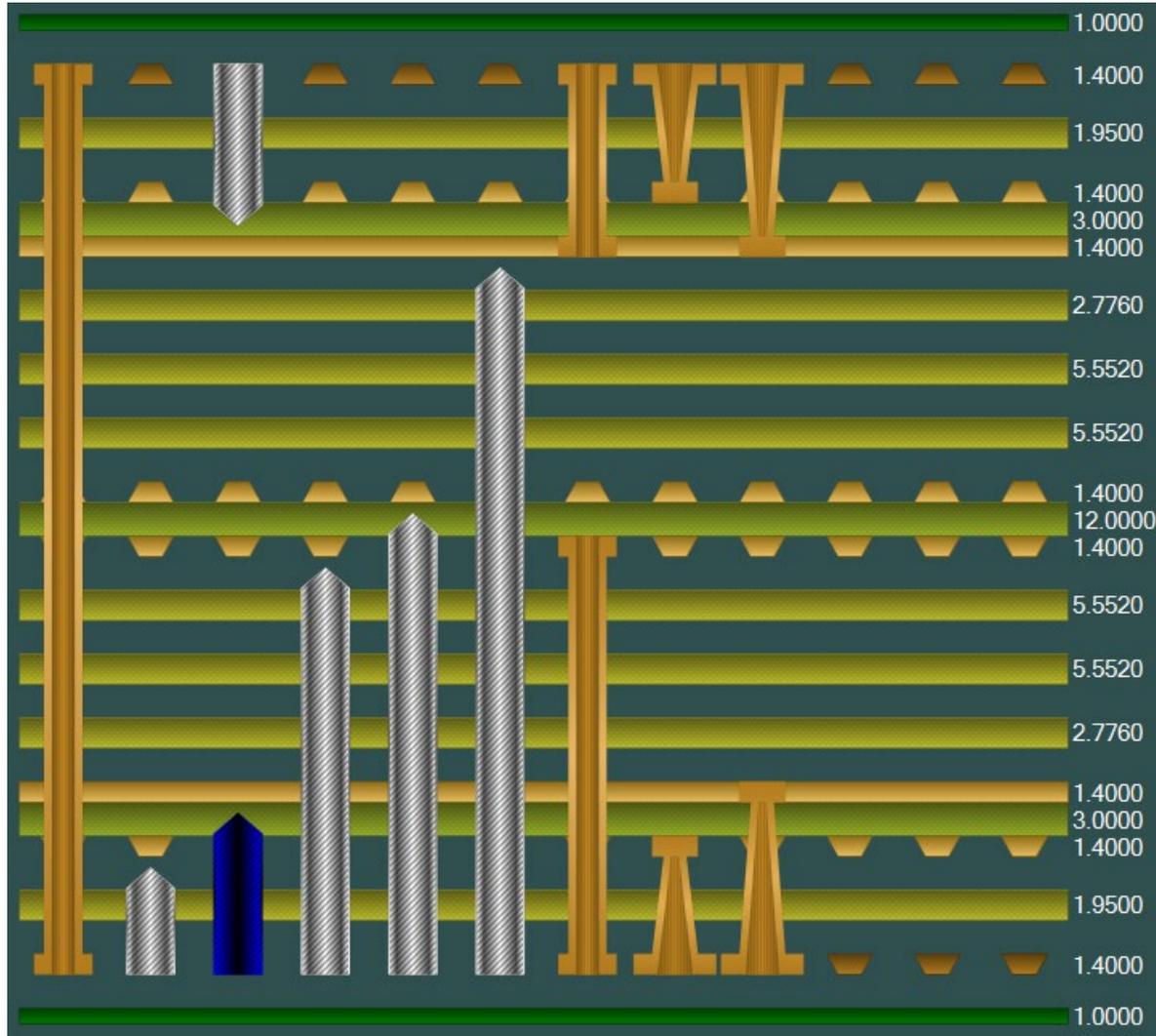
New Calculated Drill Depth – Laser Drills



Calculated Drill Depth - Laser Drills. This includes just the first copper layer thickness

Calculated Drill Depth - Laser	3.3500
--------------------------------	--------

New Calculated Drill Depth – Back Drills



Calculated Drill Depth - Back Drills. Two Drill Depths are shown, from the first electrical layer to the must-cut layer and from the first electrical layer to the must-not-cut layer

Calculated Drill Depth - Back Drill Must-Cut	4.7500
Calculated Drill Depth - Back Drill Must-Not-Cut	9.1500

New Calculated Drill Depth enhancements

C:\Apps\Samples\Calculated Drill Depth Example - 8 layers.sci Units: Mils

Layer	Supplier	Description	Type	Processed Thickness	cr	Loss Tangent	Impedance ID
1	Polar Samples	Liquid Photolmageable Mask	SolderMask	1.000	4.000	0.0195	
1	Polar Samples	Copper Foil	Copper	1.400			
2	Polar Samples	PrePreg 1080	Dielectric	1.950	4.200	0.0195	
3	Polar Samples	FR4 Core	FR4	3.000	4.200	0.0195	
3	Polar Samples	FR4 Core	FR4	1.400			
4	Polar Samples	PrePreg 3080	Dielectric	2.776	4.200	0.0195	
4	Polar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
5	Polar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
5	Polar Samples	FR4 Core	FR4	1.400	4.200	0.0195	
5	Polar Samples	FR4 Core	FR4	1.400			
6	Polar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
6	Polar Samples	PrePreg 1651	Dielectric				
6	Polar Samples	PrePreg 3080	Dielectric				
7	Polar Samples	FR4 Core					
7	Polar Samples	PrePreg 1080	Dielectric				
8	Polar Samples	Copper Foil	Copper				
8	Polar Samples	Liquid Photolmageable Mask	Solder				

Copper Thickness = 11.200 | Dielectric Thickness = 49.000
 Stack Up Thickness = 60.860 | Stack Up Thickness = 58.060
 Stack Up Cost = 54.00

Drill Image	Column Position	Drill Type	1st Layer	2nd Layer	Must-Cut Layer No	Must-Not-Cut Layer No	Calculated Drill Depth - Mechanical	Calculated Drill Depth - Laser	Calculated Drill Depth - Back Drill Must-Cut	Calculated Drill Depth - Back Drill Must-Not-Cut
	8	Laser PTH	1	2	-	-	0.000	3.350	0.000	0.000
	7	Mechanical PTH	1	3	-	-	9.150	0.000	0.000	0.000
	9	Laser PTH	1	3	-	-	0.000	7.750	0.000	0.000

The Calculated Drill Depth results have been added to the Technical Report as Drill Table selectable columns

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New Calculated Drill Depth enhancements

C:\Apps\Samples\Calculated Drill Depth Example - 8 layers.sci Units: Mils



Drill Image	Column Position	Drill Type	1st Layer	2nd Layer	Must-Cut Layer No	Must-Not-Cut Layer No	Calculated Drill Depth - Mechanical	Calculated Drill Depth - Laser	Calculated Drill Depth - Back Drill Must-Cut	Calculated Drill Depth - Back Drill Must-Not-Cut
	3	Back Drill	1	-	2	3	0.000	0.000	4.750	9.150
	1	Mechanical PTH	1	8	-	-	60.860	0.000	0.000	0.000
	6	Back Drill	8	-	4	3	0.000	0.000	37.830	53.110
	5	Back Drill	8	-	5	4	0.000	0.000	24.430	37.830
	4	Back Drill	8	-	6	5	0.000	0.000	9.150	24.430
	7	Mechanical PTH	8	5	-	-	24.430	0.000	0.000	0.000
	3	Back Drill	8	-	7	6	0.000	0.000	4.750	9.150
	9	Laser PTH	8	6	-	-	0.000	7.750	0.000	0.000
	8	Laser PTH	8	7	-	-	0.000	3.350	0.000	0.000
	2	Back Drill	8	-	8	7	0.000	0.000	1.400	4.750

Notes

The Calculated Drill Depth results have been added to the Technical Report as Drill Table selectable columns

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Speedstack v24.04.08 (April 2024)

New Structure More Calculations option

Substrate 1 Height	H1	6.3500
Substrate 1 Dielectric	Er1	4.2000
Lower Trace Width	W1	7.6500
Upper Trace Width	W2	6.6500
Trace Separation	S1	8.1150
Trace Thickness	T1	1.4000
Coating Above Substrate	C1	1.0000
Coating Above Trace	C2	1.0000
Coating Between Traces	C3	1.0000
Coating Dielectric	CEr	4.0000
Differential Impedance	Zd	100.29
Target Impedance		100.00
Target Tolerance %		10.00

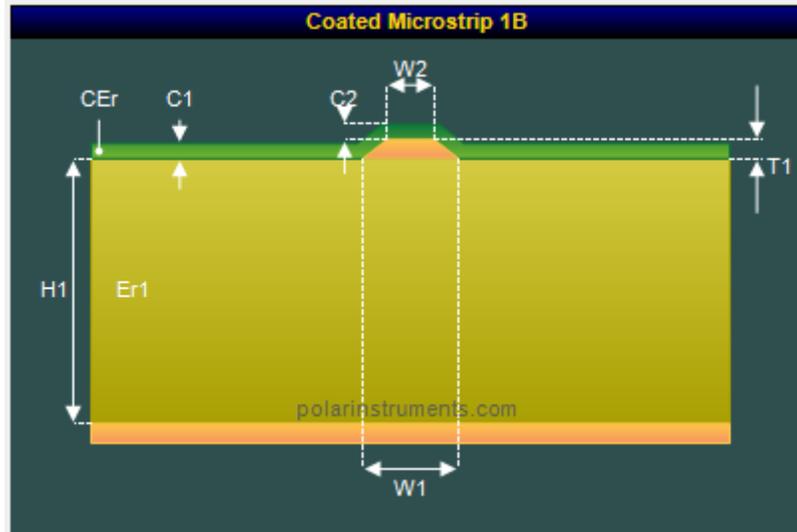
On the structure toolbar there is a new More Calculations button. On selecting this option the following field solver results will be calculated:

Singled-Ended Structures: Impedance (Z_0), Delay, Inductance, Capacitance, Effective Dielectric Constant, Velocity of Propagation

Differential Structures: Differential Impedance (Z_{diff}), Delay (Odd Mode), Odd Mode Impedance (Z_{odd}), Even Mode Impedance (Z_{even}), Common Mode Impedance (Z_{common}), Effective Dielectric Constant, Velocity of Propagation, Near-End Crosstalk (NEXT), Coupling Percentage

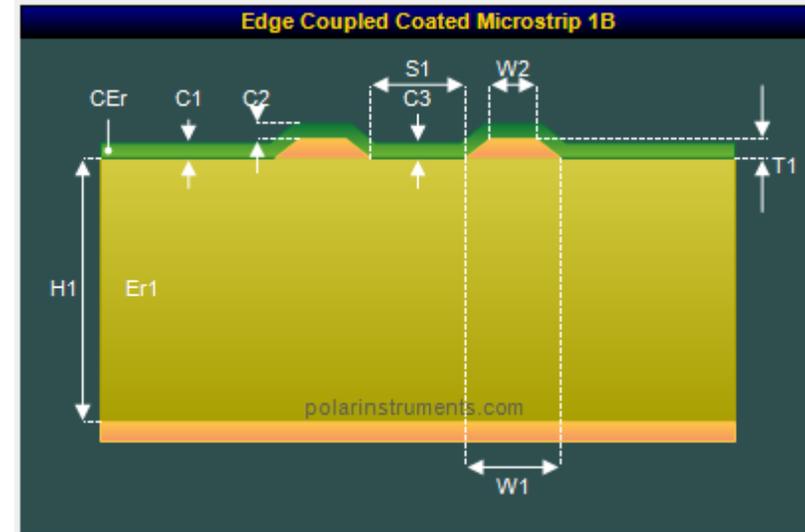
New Structure More Calculations option

Single-ended structure results



More Calculations			
Impedance	Zo	<input type="text" value="75.802"/>	<input type="button" value="Close"/>
Delay (ps/in)	D	<input type="text" value="152.272"/>	
Inductance (nH/in)	L	<input type="text" value="11.543"/>	
Capacitance (pF/in)	C	<input type="text" value="2.009"/>	
Effective Dielectric Constant	E _{Er}	<input type="text" value="3.230"/>	
Velocity of Propagation (CITS)	Vp	<input type="text" value="0.556"/>	

Differential structure results



More Calculations			
Differential Impedance	Z _{diff}	<input type="text" value="100.289"/>	<input type="button" value="Close"/>
Delay (Odd Mode) (ps/in)	D	<input type="text" value="147.683"/>	
Odd Mode Impedance	Z _{odd}	<input type="text" value="50.144"/>	
Even Mode Impedance	Z _{even}	<input type="text" value="67.086"/>	
Common Mode Impedance	Z _{common}	<input type="text" value="33.543"/>	
Effective Dielectric Constant	E _{Er}	<input type="text" value="3.038"/>	
Velocity of Propagation (CITS)	Vp	<input type="text" value="0.574"/>	
Near-End Crosstalk (NEXT)	K _b	<input type="text" value="7.2257E-02"/>	
Coupling Percentage	CP	<input type="text" value="7.226"/>	

New Structure More Calculations option

The technical report has been enhanced with 13 new user-selectable columns on the impedance table – see red box.

In this example we have selected all 13 columns, which is unlikely in production use, but is good to show the new functionality.

As the impedance table contains both Single-Ended or Differential structures the columns that aren't appropriate for a given structure type are set to 0.

C:\Apps\Samples\Eval Imperial.sci Units: Mils

Layer	Supplier	Supplier Description	Description	Type	Processed Thickness	Mask Thickness	er	Impedance ID
1	Polar Samples	SM/001	Liquid PhotoImageable Mask	SolderMask	1.000	1.000	4.000	
1	Polar Samples	FO/001	Copper Foil	Copper	1.400			1, 2
2	Polar Samples	PP/001	PrePreg 1080	Dielectric	1.950		4.200	
3	Polar Samples	CO/005	FR4 Core	FR4	1.400		4.200	
3	Polar Samples	PP/002	PrePreg 3080	Dielectric	2.776		4.200	
3	Polar Samples	PP/004	PrePreg 1651	Dielectric	5.552		4.200	
3	Polar Samples	PP/004	PrePreg 1651	Dielectric	5.552		4.200	
4	Polar Samples	CO/020	FR4 Core	FR4	1.400		4.200	3
4	Polar Samples	PP/004	PrePreg 1651	Dielectric	5.552		4.200	
4	Polar Samples	PP/004	PrePreg 1651	Dielectric	5.552		4.200	
4	Polar Samples	PP/002	PrePreg 3080	Dielectric	2.776		4.200	
5	Polar Samples	CO/005	FR4 Core	FR4	1.400		4.200	
5	Polar Samples	PP/004	PrePreg 1651	Dielectric	5.552		4.200	
5	Polar Samples	PP/004	PrePreg 1651	Dielectric	5.552		4.200	
5	Polar Samples	PP/002	PrePreg 3080	Dielectric	2.776		4.200	
6	Polar Samples	CO/005	FR4 Core	FR4	1.400		4.200	
6	Polar Samples	PP/001	PrePreg 1080	Dielectric	1.950		4.200	
7	Polar Samples	FO/001	Copper Foil	Copper	1.400			4
8	Polar Samples	SM/001	Liquid PhotoImageable Mask	SolderMask	1.000	1.000	4.000	

Copper Thickness = 11.200 | Dielectric Thickness = 49.660 | Solder Mask Thickness = 2.000 | Stack Up Thickness = 60.860 | Stack Up Thickness = 62.860 | Solder Mask Thickness = 62.860
Stack Up Cost = 54.00

Impedance ID	Structure Image	Impedance Signal Layer	Ref. Plane 1 in Layer	Ref. Plane 2 in Layer	Impedance (Zo)	Delay (D) (ps/in)	Inductance (L) (nH/in)	Capacitance (C) (pF/in)	Differential Impedance (Zdiff)	Delay (Odd Mode) (D) (ps/in)	Odd Mode Impedance (Zodd)	Even Mode Impedance (Zeven)	Common Mode Impedance (Zcommon)	Effective Dielectric Constant (EEr)	Velocity of Propagation (CITS) (Vp)	Near-End Crosstalk (NEXT) (Kb)	Coupling Percentage (CP)
1		1	3	0	0.000	0.000	0.000	0.000	100.289	147.683	50.144	67.086	33.543	3.038	0.574	7.2257E-02	7.226
2		1	3	0	75.802	152.272	11.543	2.009	0.000	0.000	0.000	0.000	0.000	3.230	0.556	0.0000E+00	0.000
3		4	3	6	0.000	0.000	0.000	0.000	101.278	173.635	50.639	85.202	42.601	4.200	0.488	1.2722E-01	12.722
4		8	6	0	75.802	152.272	11.543	2.009	0.000	0.000	0.000	0.000	0.000	3.230	0.556	0.0000E+00	0.000

StackName: Master	Version:	Revision:	Modification:	Date of Revision:	Editor	Page 1/X
Date:	Associated Documents:					
Author:						
Department:						
Site:						

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Gradient Roughness Method

Length of Line LL: 4000.0000
 Trace Conductivity (S/m) TC: 5.800E+07
 Frequency Minimum (MHz) FMin: 500.0000
 Frequency Maximum (GHz) FMax: 10.0000
 Frequency Steps FStep: 20
 Frequency of Interest (MHz) Freq: 1000.0000

Result Presentation: Length of Line / in / m
 Substrate Causal Extrapolation Reference Points:
 Set Dielectric Constant (Er) from Stack Up materials
 Set Loss Tangent (TanD) from Stack Up materials

	Freq (Hz)	Ref Er	Ref TanD
H1	1.000E+09	4.2000	0.0195
H2			
H3			
H4			
RER			
CEr	1.000E+09	4.0000	0.0195

Surface Roughness Compensation:
 Smooth
 Hammerstad
 Grosse
 Gradient (Beta)
 Huray

Print Settings:
 Include Loss Graph for this structure on the report

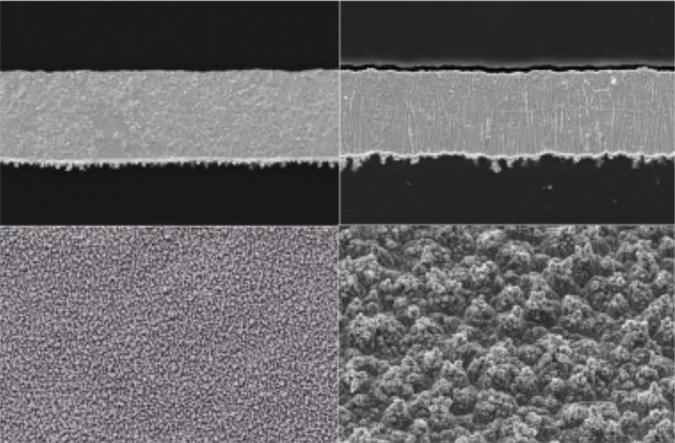
The Gradient method has been added to the Surface Roughness Compensation options

Graph | Odd Mode | Even Mode

Graph Settings:
 Display Series: All Losses
 Differential: Differential
 Loss Budget (dB): 0.0000
 Picked Data Point Information: [Empty]

Update Cannonball-Huray Method to Simonovich-Cannonball Method

Surface Roughness Compensation - Huray



Images by courtesy of Circuit Foil Luxembourg

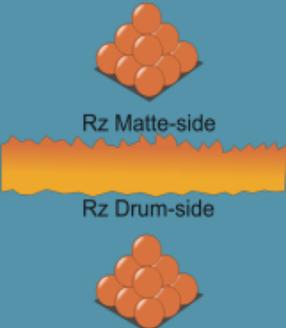
Ratio of Areas	1.0000
Effective Ball Radius (μm)	0.2240
Area of Ball Count ($\text{sq } \mu\text{m}$)	1.8060
Number of Balls in Area	14

Apply
Cancel

Update / rebrand of the Cannonball-Huray Method to Simonovich-Cannonball Method.
Application Note now links to two papers

Calculate

Simonovich-Cannonball Model



Rz Matte-side
Rz Drum-side

www.polarinstruments.com

Courtesy of Bert Simonovich, Lamsim Enterprises Inc [Application Note](#)

Enable Simonovich-Cannonball

Matte-Side Roughness
Rz Matte (μm) 4.4430

Drum-Side Roughness
Rz Drum (μm) 3.0480

Other enhancements

- New import / export XML STKX v24.00 and SSX v14.00 file formats to support the new Gradient Surface Roughness Compensation Method
- Updated to support latest BEM Calculation Engine
- FlexNet Publisher / FLEXIm v11.19.0.0 supported
- Printing: Fixed problem where the Laminate to Laminate dimension was not calculated corrected when materials spanned multiple print pages

Speedstack v24.01.01 (Jan 2024)

Enhancements

- From 2024 Speedstack will be running on the Microsoft .Net Framework 4.8. It has migrated as a result of customer IT policy requests and we are working on new functionality for releases later in Q1 based on this new platform

Speedstack v23.09.01 (Sept 2023)

Design Rule Check (DRC) Enhancements

Stack Up Editor | DRC : 1 | Controlled Impedance | CI Results

DRC Test Selection

- Design Logic
- Symmetry
- Copper Balance
- Board Thickness
- Manufacturing Tests (Tools | Manufacturing Constraints)
 - Active Constraint : Polar Microns
 - Min. Trace Width
 - Min. Gap Width
 - Aspect Ratios
 - Mechanical Drill
 - Buried Laser Microvia
 - Blind Laser Microvia
 - Trace
 - Resin Starvation

Maximum Drill Aspect Ratio Exceeded L1 - L4, Col3

Design Rule Check information for Drills has been enhanced to provide more information, including start / end electrical layers and the column where the errant drill is located

Layer	Material	Thickness (Mils/Thous)	
-	SM	Liquid PhotoImageable Mask	4.000/0.0195
1	Foil	Copper Foil	1.4000
-	PP	PrePreg 1080	4.200/0.0195
2	-	-	1.4000
3	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 3080	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
4	Core	FR4 Core	4.200/0.0195
5	-	-	1.4000
-	PP	PrePreg 1651	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
-	PP	PrePreg 3080	4.200/0.0195
6	Core	FR4 Core	4.200/0.0195
7	-	-	1.4000
-	PP	PrePreg 1080	4.200/0.0195
8	Foil	Copper Foil	1.4000
-	SM	Liquid PhotoImageable Mask	4.000/0.0195

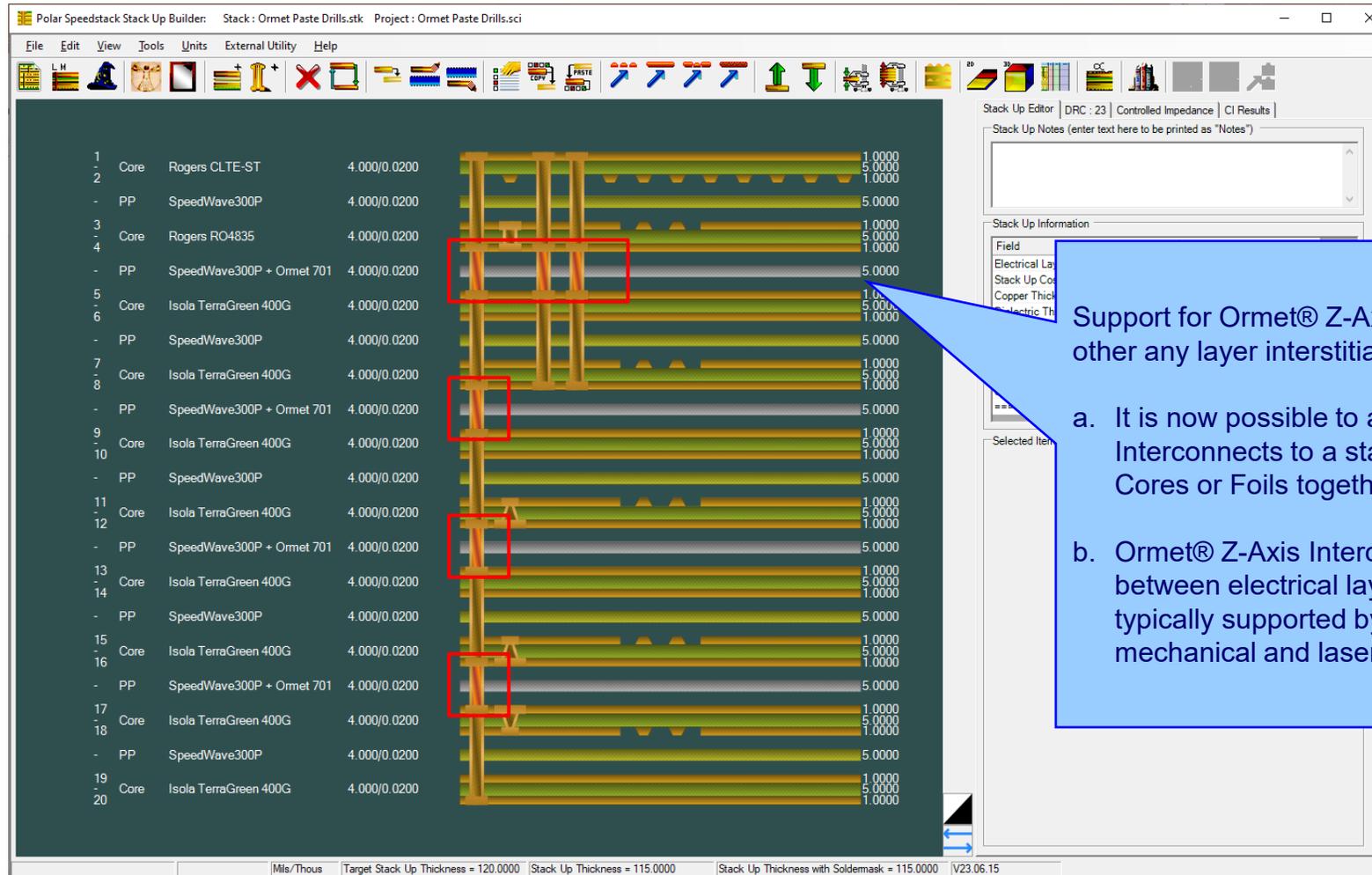
Mils/Thous | Target Stack Up Thickness = 60.0000 | Stack Up Thickness = 60.8600 | Stack Up Thickness with Soldermask = 62.8600 | V24.01.01

Other enhancements

- Printing: Improvements to the Solder Mask to Solder Mask thickness line, particularly when an ident / coverlay / peelable material is above or below the Solder Mask
- Printing: Bill of Materials (BOM) table enhancements including options to enable / disable Number of Panels, Circuits Per Panel, Cost Per Circuit that appear under BOM table
- Editor: Multi-selected materials will now stay selected when right-mouse menu is used to bring up context menu

Speedstack v23.06.15 (June 2023)

Drill Enhancements including support for Ormet® Z-Axis Interconnects or other any layer interstitial via technology



The screenshot shows the Polar Speedstack Stack Up Builder interface. The main window displays a list of layers and a 3D cross-section of the stack up. The layers are as follows:

Layer No.	Material	Thickness (mm)	Thickness (in)
1	Core Rogers CLTE-ST	4.000	0.0200
2	PP SpeedWave300P	4.000	0.0200
3	Core Rogers RO4835	4.000	0.0200
4	PP SpeedWave300P + Ormet 701	4.000	0.0200
5	Core Isola TerraGreen 400G	4.000	0.0200
6	PP SpeedWave300P	4.000	0.0200
7	Core Isola TerraGreen 400G	4.000	0.0200
8	PP SpeedWave300P + Ormet 701	4.000	0.0200
9	Core Isola TerraGreen 400G	4.000	0.0200
10	PP SpeedWave300P	4.000	0.0200
11	Core Isola TerraGreen 400G	4.000	0.0200
12	PP SpeedWave300P + Ormet 701	4.000	0.0200
13	Core Isola TerraGreen 400G	4.000	0.0200
14	PP SpeedWave300P	4.000	0.0200
15	Core Isola TerraGreen 400G	4.000	0.0200
16	PP SpeedWave300P + Ormet 701	4.000	0.0200
17	Core Isola TerraGreen 400G	4.000	0.0200
18	PP SpeedWave300P	4.000	0.0200
19	Core Isola TerraGreen 400G	4.000	0.0200
20	PP SpeedWave300P	4.000	0.0200

The 3D view shows the stack up with Ormet Z-axis interconnects (red boxes) placed between various layers, including between cores and foils, and between electrical layers.

Stack Up Editor | DRC : 23 | Controlled Impedance | CI Results

Stack Up Notes (enter text here to be printed as "Notes")

Stack Up Information

Field

Electrical La

Stack Up Co

Copper Thick

Electric Th

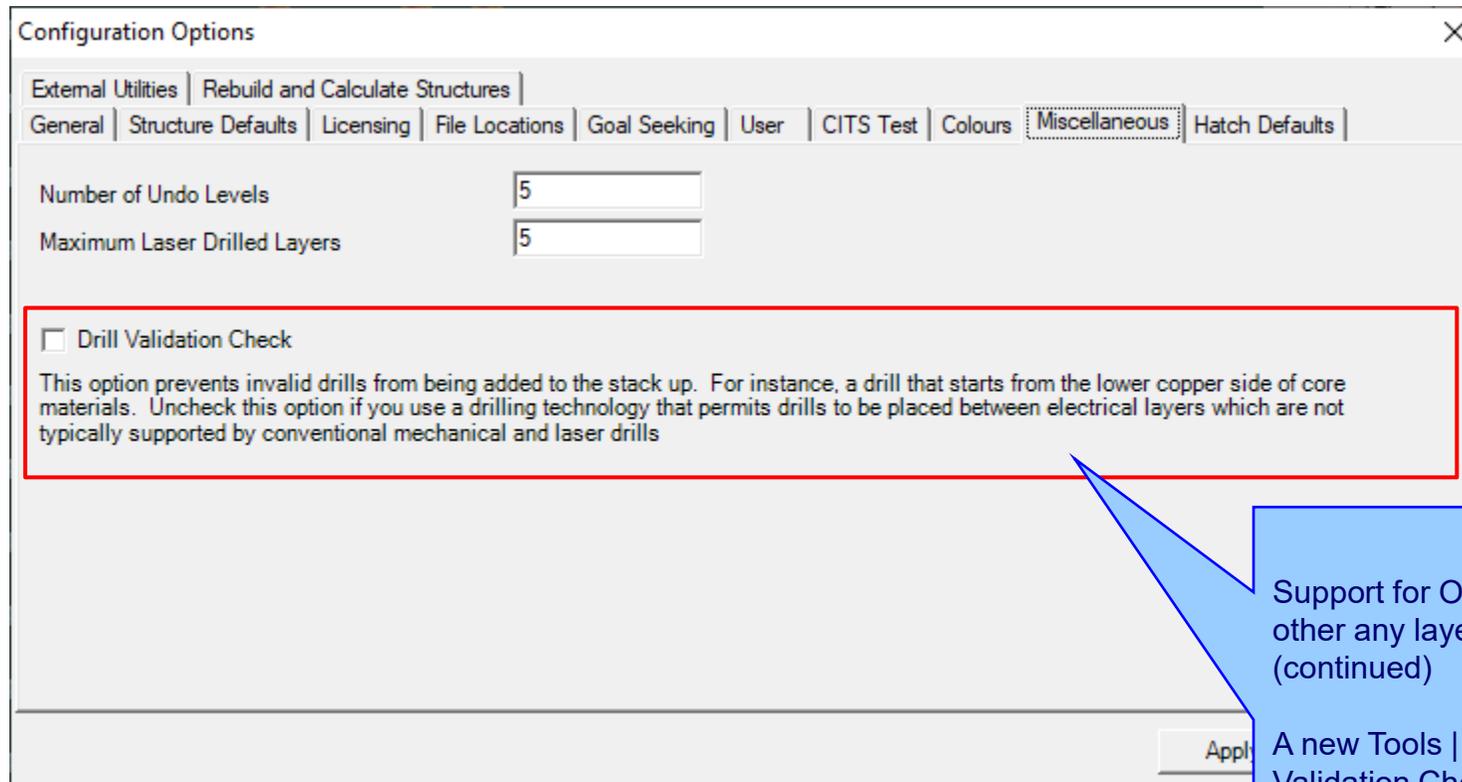
Selected Item

Target Stack Up Thickness = 120.0000 | Stack Up Thickness = 115.0000 | Stack Up Thickness with Soldermask = 115.0000 | V23.06.15

Support for Ormet® Z-Axis Interconnects or other any layer interstitial via technology

- It is now possible to add Ormet® Z-Axis Interconnects to a stack up to connect two Cores or Foils together
- Ormet® Z-Axis Interconnects can be placed between electrical layers which are not typically supported by conventional mechanical and laser drills

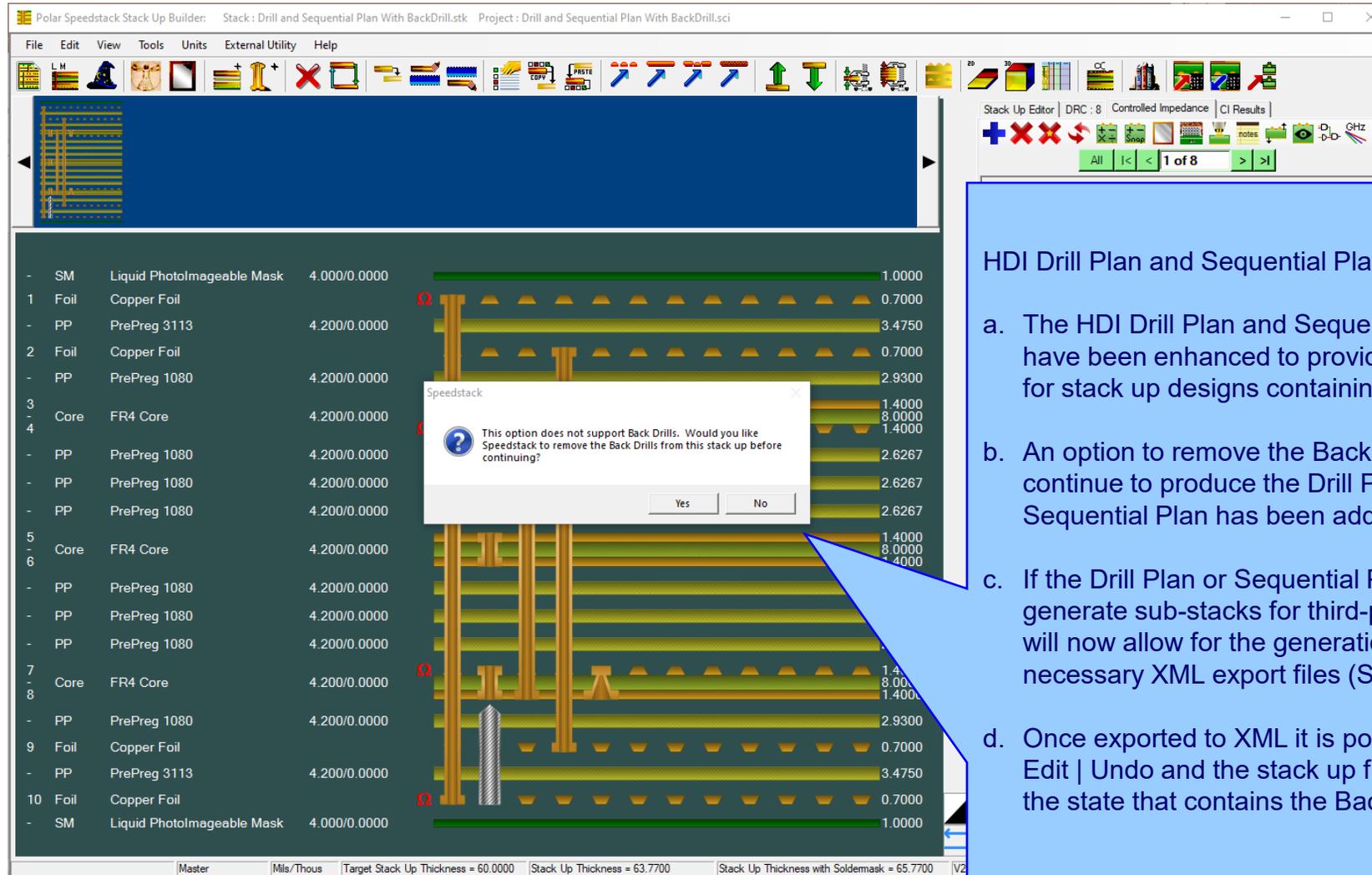
Enhancements including support for Ormet® Z-Axis Interconnects or other any layer interstitial via technology



Support for Ormet® Z-Axis Interconnects or other any layer interstitial via technology (continued)

A new Tools | Options | Miscellaneous tab Drill Validation Check option has been introduced. Unchecking this option will disable the Speedstack invalid drills check in order to support the Ormet® Z-Axis Interconnects technology

HDI Drill Plan and Sequential Plan Enhancements



HDI Drill Plan and Sequential Plan Enhancements

- The HDI Drill Plan and Sequential Plan options have been enhanced to provide better support for stack up designs containing Back Drills
- An option to remove the Back Drills and continue to produce the Drill Plan or Sequential Plan has been added
- If the Drill Plan or Sequential Plan is used to generate sub-stacks for third-party tools, this will now allow for the generation of the necessary XML export files (SSX)
- Once exported to XML it is possible to select Edit | Undo and the stack up file will return to the state that contains the Back Drills

HDI Drill Plan and Sequential Plan Enhancements

Layer	Material	Thickness (mm)	Thickness (in)
-	SM	Liquid Photolimageable Mask	4.000/0.0000
1	Foil	Copper Foil	0.7000
-	PP	PrePreg 3113	4.200/0.0000
2	Foil	Copper Foil	0.7000
-	PP	PrePreg 1080	4.200/0.0000
3	Core	FR4 Core	1.4000
4			8.0000
			1.4000
-	PP	PrePreg 1080	4.200/0.0000
-	PP	PrePreg 1080	4.200/0.0000
-	PP	PrePreg 1080	4.200/0.0000
5	Core	FR4 Core	1.4000
6			8.0000
			1.4000
-	PP	PrePreg 1080	4.200/0.0000
-	PP	PrePreg 1080	4.200/0.0000
-	PP	PrePreg 1080	4.200/0.0000
7	Core	FR4 Core	1.4000
8			8.0000
			1.4000
-	PP	PrePreg 1080	4.200/0.0000
9	Foil	Copper Foil	0.7000
-	PP	PrePreg 3113	4.200/0.0000
10	Foil	Copper Foil	0.7000
-	SM	Liquid Photolimageable Mask	4.000/0.0000

HDI Drill Plan and Sequential Plan Enhancements (continued)

The completed Drill Plan, showing a separate sub-stack for each drill stage of the fabrication process

Upper Trace Width	W2	11.0000
Trace Thickness	T1	0.7000
Coating Above Substrate	C1	1.0000
Coating Above Trace	C2	1.0000
Coating Dielectric	CEr	4.0000
Impedance	Zo	51.62
Target Impedance		50.00
Target Tolerance %		10.00

Speedstack v23.05.01 (May 2023)

New Check Copper Coverage Percentage option

Stack Up Editor | DRG : 1 | Controlled Impedance | CI Results

Stack Up Editor | DRG : 1 | Controlled Impedance | CI Results

Edge Coupled Coated Microstrip 1B

SM Liquid PhotoImageable Mask 4.000/0.0195 1.0000

8 Foil Copper Foil 1.4000

PP PrePreg 1080 4.200/0.0195 1.9500

Core FR4 Core 4.200/0.0195 1.4000

6 Core FR4 Core 4.200/0.0195 1.4000

PP PrePreg 3080 4.200/0.0195 2.7760

PP PrePreg 1651 4.200/0.0195 5.5520

PP PrePreg 1651 4.200/0.0195 5.5520

Core FR4 Core 4.200/0.0195 1.4000

4 Core FR4 Core 4.200/0.0195 1.4000

PP PrePreg 10 5.5520

PP PrePreg 10 5.5520

2 Core FR4 Core 1.4000

PP PrePreg 10 1.4000

1 Foil Copper Foil 1.4000

SM Liquid PhotoImageable Mask 4.000/0.0195 1.0000

Speedstack

The Copper Coverage percentage has not been entered for the following layers:

6, 7,

OK

Master | Mils/Thous | Target Stack Up Thickness = 60.0000 | Stack Up Thickness = 60.8600 | Stack Up Thickness with Soldermask = 62.8600 | V23.06.15

This new Tools menu option can be selected at any time to determine which electrical layers, if any, have a Copper Coverage Percentage of 0.

This option is useful for users that select the Proportional to Coverage Finishing method, which relies on each electrical layer having the Copper Coverage % property populated

In this example Copper Coverage percentage has not been specified for electrical layers 6 and 7

Virtual Material Wizard Improvements

Stack Up Wizard (Virtual Material Mode)

Number of Layers: 8
Target Stack Up Thickness: 60.0000
Positive Tolerance %: 10
Negative Tolerance %: 10

Symmetrical

Plane Layers: 1, 2, 3, 4, 5, 6, 7, 8
Mixed Layers: 1, 2, 3, 4, 5, 6, 7, 8

Nominal Dielectric Constant: 4.2000
Nominal Loss Tangent: 0.0195

Solder Mask Top Solder Mask Bottom

Solder Mask Dielectric Constant: 4.0000
Solder Mask Loss Tangent: 0.0195
Solder Mask Thickness: 0.0000

Preferred Core Thickness:
Copper Thickness:

Build Type: Foil Core

<Previous Next >

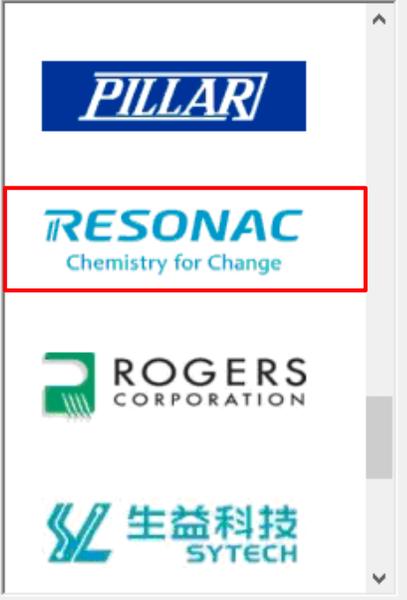
When the Symmetrical mode is selected, the Solder Mask Bottom checkbox now matches Solder Mask Top when the checkbox is selected

Under the wizard, Define Sequential Build, the colour of the core dielectric is now set to the Core Dielectric colour as defined under the Tools | Options | Colours. Previously, the core dielectric was set to the Speedstack default colour

Resonac materials added to the Online Library

Online Library

Filter by Supplier



File Type

- Foils
- RCCs
- PrePregs
- Cores
- SolderMasks
- Idents
- Peelables
- Coverlays
- BondPly
- Adhesives
- FlexCores
- Shields

Library Files Available : Resonac

- Resonac_GEA_679_1GHz_1901.mlbx
- Resonac_GEA_67BE_1GHz_1901.mlbx
- Resonac_GEA_67N_1GHz_1901.mlbx
- Resonac_GEA_705G(L)_1GHz_2201.mlbx
- Resonac_GEA_705G_1GHz_2201.mlbx
- Resonac_GFA_2_1GHz_1901.mlbx
- Resonac_GHA_679G(S)_1GHz_1901.mlbx
- Resonac_GHA_679G_1GHz_1901.mlbx
- Resonac_GWA_900G_1GHz_1901.mlbx
- Resonac_GWA_910G_1GHz_1901.mlbx

Append

Close

Clear
Use this option to clear data from the existing library data table

Filter by Frequency

All

1 GHz 20 GHz

5 GHz 50 GHz

10 GHz 75 GHz

Library Files Selected during this session

File Access Mode

Online Polar Library (ftp://polarinstruments.com)

On-Premise Mode [Application Note](#)

C:\Users\vicha\AppData\Roaming\Polar\Speedstack\MaterialLibrary

Please Note: This data is accurate to the best of our knowledge, however it is provided, as is from our Material supplier partners. Please feedback any errors or inaccuracies to Polarcare and we will contact the material partner for clarification or rectification.

Speedstack v23.04.02 (April 2023)

Manufacturing Constraints / Design Rule Check Enhancements

The screenshot shows the Polar Speedstack Stack Up Builder interface. The main window displays a stack up design with layers and their thicknesses. A red vertical bar highlights a specific layer. On the right, a 'Stack Up Editor' window is open, showing 'DRC Test Selection' options. A red box highlights the 'Manufacturing Tests' section, which includes 'Min. Trace Width', 'Min. Gap Width', 'Mechanical Drill', 'Buried Laser Microvia', 'Blind Laser Microvia', and 'Trace'. A blue callout box points to the 'Maximum Drill Aspect Ratio Exceeded' error message.

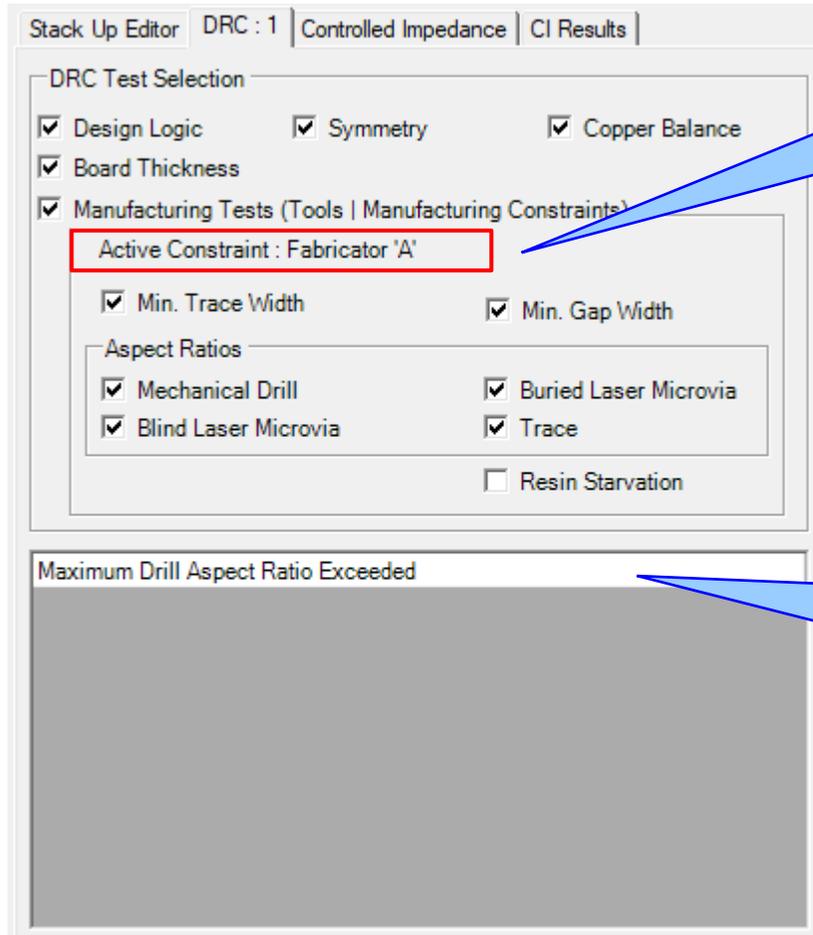
Layer	Material	Thickness (Mils/Thous)	Order
-	SM	Liquid Photolmageable Mask	4.000/0.0195
1	Foil	Copper Foil	1.4000
-	PP	PrePreg 1080	4.200/0.0195
2	Core	FR4 Core	1.4000
-	PP	PrePreg 3080	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
4	Core	FR4 Core	1.4000
-	PP	PrePreg 1651	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
-	PP	PrePreg 3080	4.200/0.0195
6	Core	FR4 Core	1.4000
-	PP	PrePreg 1080	4.200/0.0195
8	Foil	Copper Foil	1.4000
-	SM	Liquid Photolmageable Mask	4.000/0.0195

The Speedstack Design Rule Checks (DRC) highlight potential problems with the stack up design.

The rules used by the DRC are held within the Manufacturing Constraints, where different constraints can be configured based upon the PCB fabricators capabilities.

V23.04 offers some significant Manufacturing Constraints / Design Rule Check enhancements over previous versions of Speedstack.

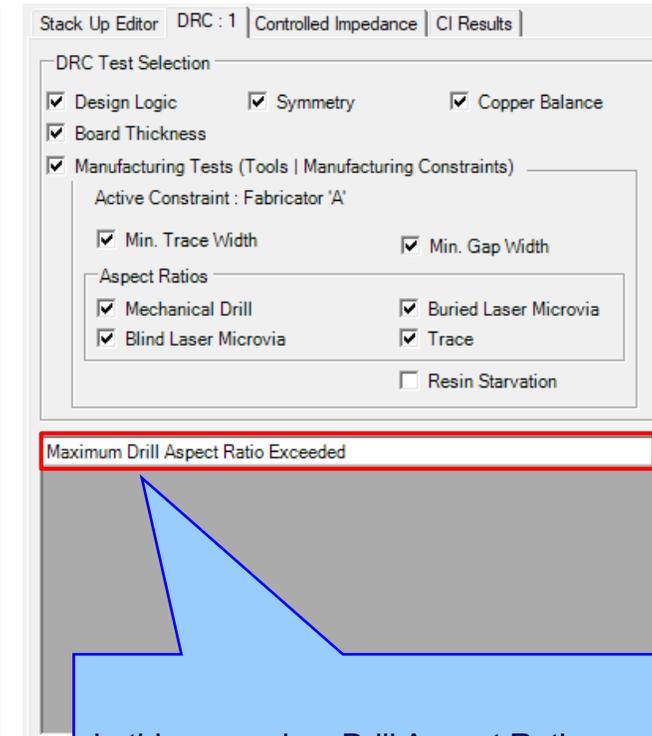
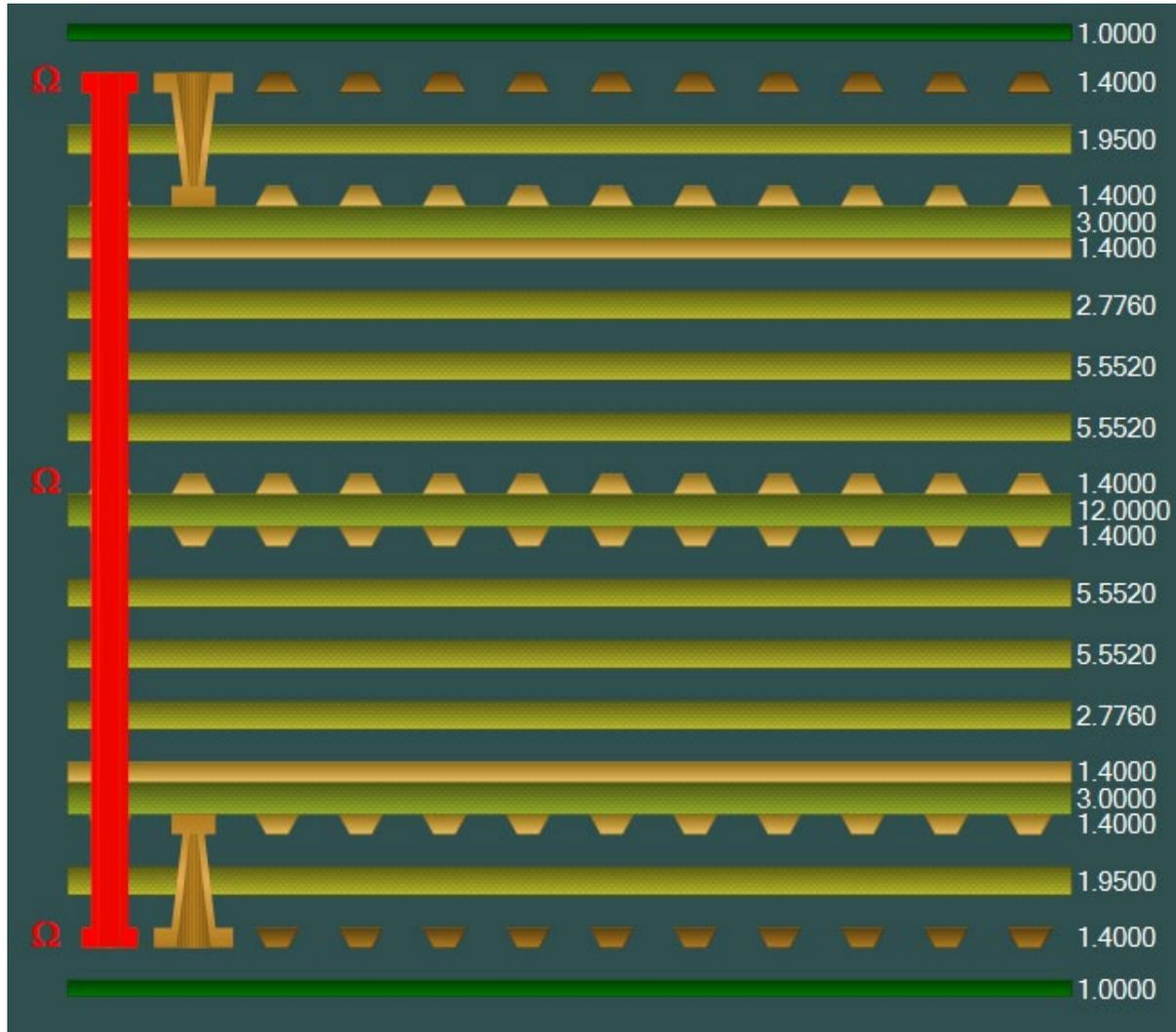
Manufacturing Constraints / Design Rule Check Enhancements



The Active Constraint name is now displayed here so the current selected set of Manufacturing Constraints is easily identifiable

DRC errors are listed here. Clicking the error will graphically highlight the problem on the stack up

Manufacturing Constraints / Design Rule Check Enhancements



In this example a Drill Aspect Ratio error has been identified, clicking on the error will highlight the offending drill in red.

Drill Aspect Ratio checks the length of the drill against the diameter to determine whether plating problems might occur

Manufacturing Constraints / Design Rule Check Enhancements

Manufacturing Constraints

Active Constraint : Fabricator 'A'

	Manufacturer's Name	Blind Laser Via A. R.	Buried Laser Via A.	Mechanical Drill A. R.	Minimum Gap	Minimum Trace Width	Trace A. R.	Units
	Polar Microns	0.5	0.5	8.5	75	75	1	Microns
	Polar Mils	0.5	0.5	8.5	3	3	1	Mils
	Polar Millimetres	0.5	0.5	8.5	0.075	0.075	1	Millimetres
	Polar Inches	0.5	0.5	8.5	0.003	0.003	1	Inches
▶	Fabricator 'A'	0.5	0.5	6	3	3	1	Mils

Instructions: Double-Click the Data Grid row to edit, add or delete a constraint

Highlight and Set Active Constraint

Highlight Set

Switching the active constraint is achieved by selecting the required Data Grid row and clicking Set

The Tools | Manufacturing Constraints option provides options to Add, Delete and Edit the constraints. Multiple sets of constraints are supported, allowing the stack up design to be checked against different fabricators capabilities.

The current active constraint used by the DRC tab, Fabricator 'A', is displayed above the Data Grid

Manufacturing Constraints / Design Rule Check Enhancements

Manufacturing Constraints

Active Constraint : Fabricator 'A'

	Manufacturer's Name	Blind Laser Via A. R.	Buried
	Polar Microns	0.5	
	Polar Mils	0.5	
	Polar Millimetres	0.5	
	Polar Inches	0.5	
▶	Fabricator 'A'	0.5	

add or delete a constraint

Highlight Set

Edit Constraints

Units

Mils Microns
 Inches Millimetres

Option Name: Fabricator 'A'

Minimum Gap: 3

Minimum Trace Width: 3

Mechanical Drill A.R.: 6

Blind Via A.R.: 0.5

Buried Via A.R.: 0.5

Trace A.R.: 1

<< < 5 of 5 > >>

Add Delete Done Cancel

Instructions
Add: Press Add, which will add a new blank constraint. Notice the 'n of n' record number will increase. Now key in the constraint details and select Done.
Delete: Press Delete to remove the existing constraint. Notice the 'n of n' record number will reduce. Then select Done to close the dialog.
Edit: Edit the existing constraint and select Done to close the dialog.

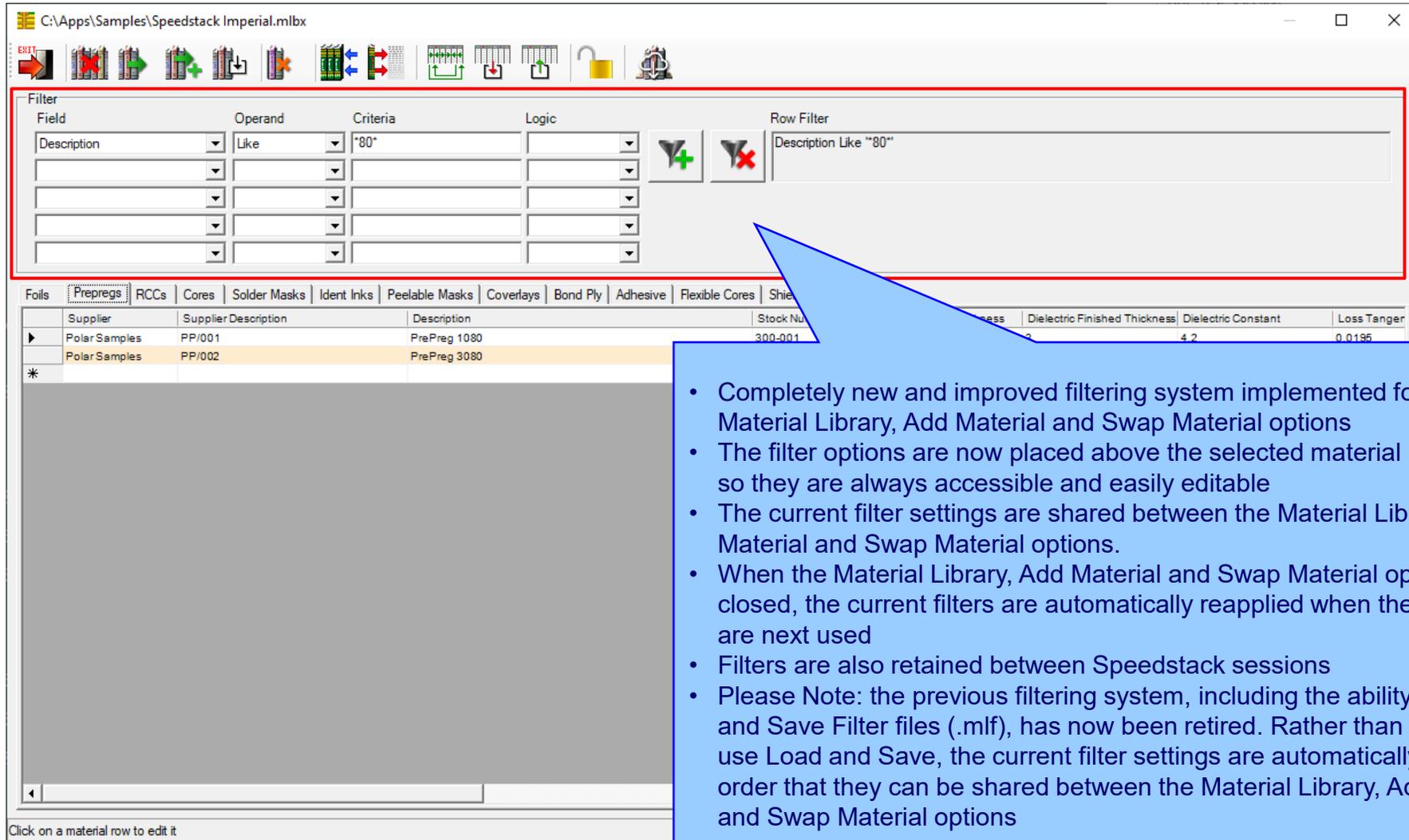
Width	Trace A. R.	Units
	1	Microns
	1	Mils
	1	Millimetres
	1	Inches
	1	Mils

Close

Double-clicking the Data Grid row presents the Edit Constraints dialog, allowing parameters to be specified based upon the PCB fabricators' capabilities

Speedstack v23.03.01 (March 2023)

Material Library Filter / Search Enhancements

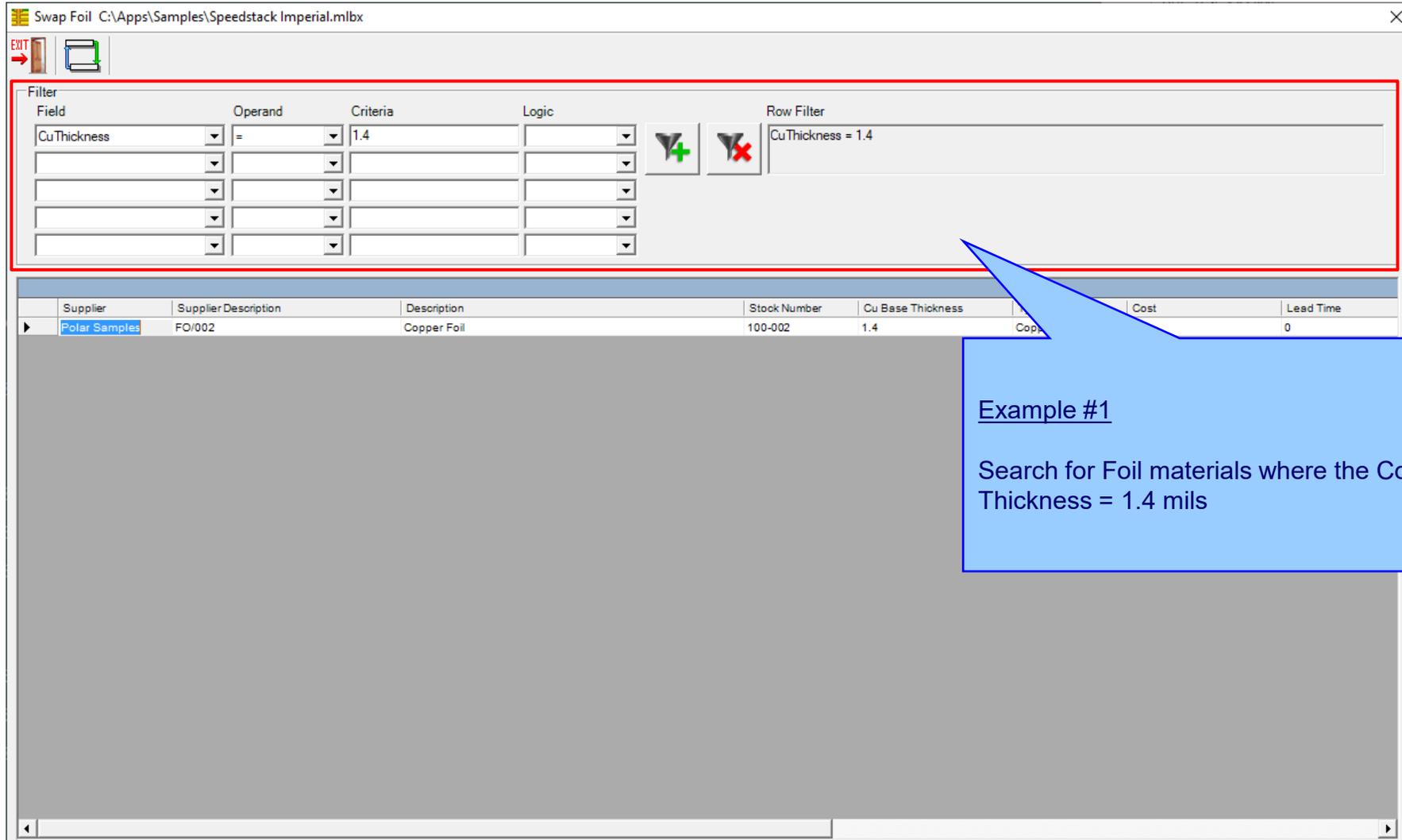


Field	Operand	Criteria	Logic	Row Filter
Description	Like	*80*		Description Like *80*

Supplier	Supplier Description	Description	Stock Number	Dielectric Finished Thickness	Dielectric Constant	Loss Tangent
Polar Samples	PP/001	PrePreg 1080	300-001		4.2	0.0195
Polar Samples	PP/002	PrePreg 3080				

- Completely new and improved filtering system implemented for the Material Library, Add Material and Swap Material options
- The filter options are now placed above the selected material Data Grid, so they are always accessible and easily editable
- The current filter settings are shared between the Material Library, Add Material and Swap Material options.
- When the Material Library, Add Material and Swap Material options are closed, the current filters are automatically reapplied when these options are next used
- Filters are also retained between Speedstack sessions
- Please Note: the previous filtering system, including the ability to Load and Save Filter files (.mlf), has now been retired. Rather than needing to use Load and Save, the current filter settings are automatically saved in order that they can be shared between the Material Library, Add Material and Swap Material options

Material Library Filter / Search Enhancements



The screenshot shows a software window titled "Swap Foil C:\Apps\Samples\Speedstack Imperial.mlbx". The window contains a "Filter" section with a table for defining search criteria. The table has columns for "Field", "Operand", "Criteria", and "Logic". The first row is populated with "CuThickness", "=", and "1.4". To the right of the table are two icons: a green plus sign and a red minus sign. Further right is a "Row Filter" section displaying "CuThickness = 1.4". Below the filter section is a data table with columns: "Supplier", "Supplier Description", "Description", "Stock Number", "Cu Base Thickness", "Cost", and "Lead Time". The first row of data is: "Polar Samples", "FO/002", "Copper Foil", "100-002", "1.4", "Copp", and "0".

Field	Operand	Criteria	Logic
CuThickness	=	1.4	

Supplier	Supplier Description	Description	Stock Number	Cu Base Thickness	Cost	Lead Time
Polar Samples	FO/002	Copper Foil	100-002	1.4	Copp	0

Example #1
Search for Foil materials where the Copper Thickness = 1.4 mils

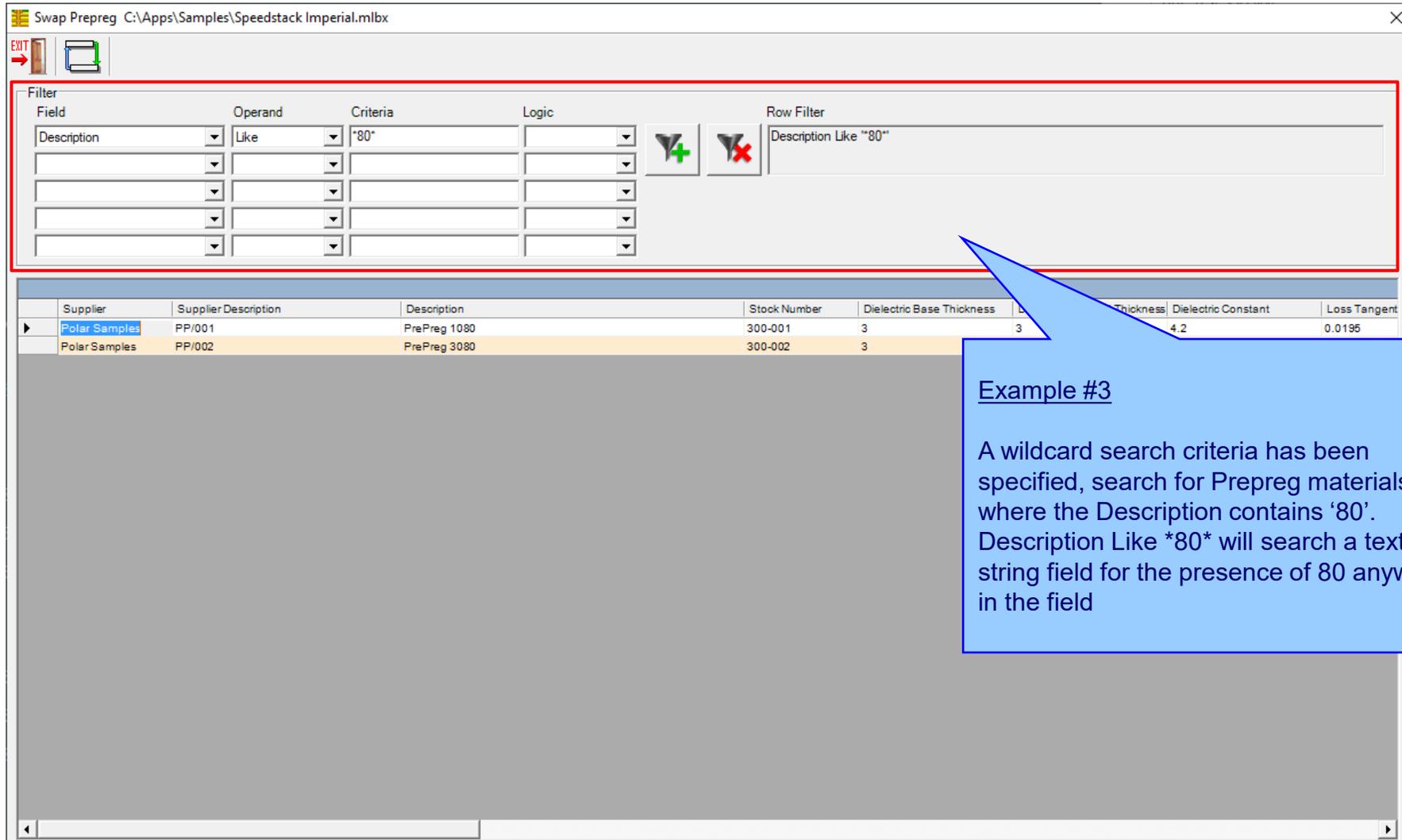
Material Library Filter / Search Enhancements

The screenshot shows a software window titled "Swap Core C:\Apps\Samples\Speedstack Imperial.mlbx". It features a "Filter" section with a table for defining search criteria. The table has columns for "Field", "Operand", "Criteria", and "Logic". Two criteria are defined: "Base Thickness" with operand ">=" and criteria "5", and "Base Thickness" with operand "<=" and criteria "10". The logic is set to "AND". A "Row Filter" box displays the resulting search expression: "Base Thickness >= 5 AND Base Thickness <= 10". Below the filter is a table of material samples.

Supplier	Supplier Description	Description	Stock Number	Dielectric Base Thickness	Dielectric Thickness	Dielectric Constant	Loss Tangent
Polar Samples	CO/010	FR4 Core	400-010	5	5	4.2	0.0195
Polar Samples	CO/011	FR4 Core	400-011	5			
Polar Samples	CO/012	FR4 Core	400-012	5			
Polar Samples	CO/013	FR4 Core	400-013	6			
Polar Samples	CO/014	FR4 Core	400-014	6			
Polar Samples	CO/015	FR4 Core	400-015	6			
Polar Samples	CO/016	FR4 Core	400-016	8			
Polar Samples	CO/017	FR4 Core	400-017	8			
Polar Samples	CO/018	FR4 Core	400-018	8			

Example #2
Two search criteria are specified, for Core materials where the Base Thickness >= 5 mils and Base Thickness <= 10 mils

Material Library Filter / Search Enhancements

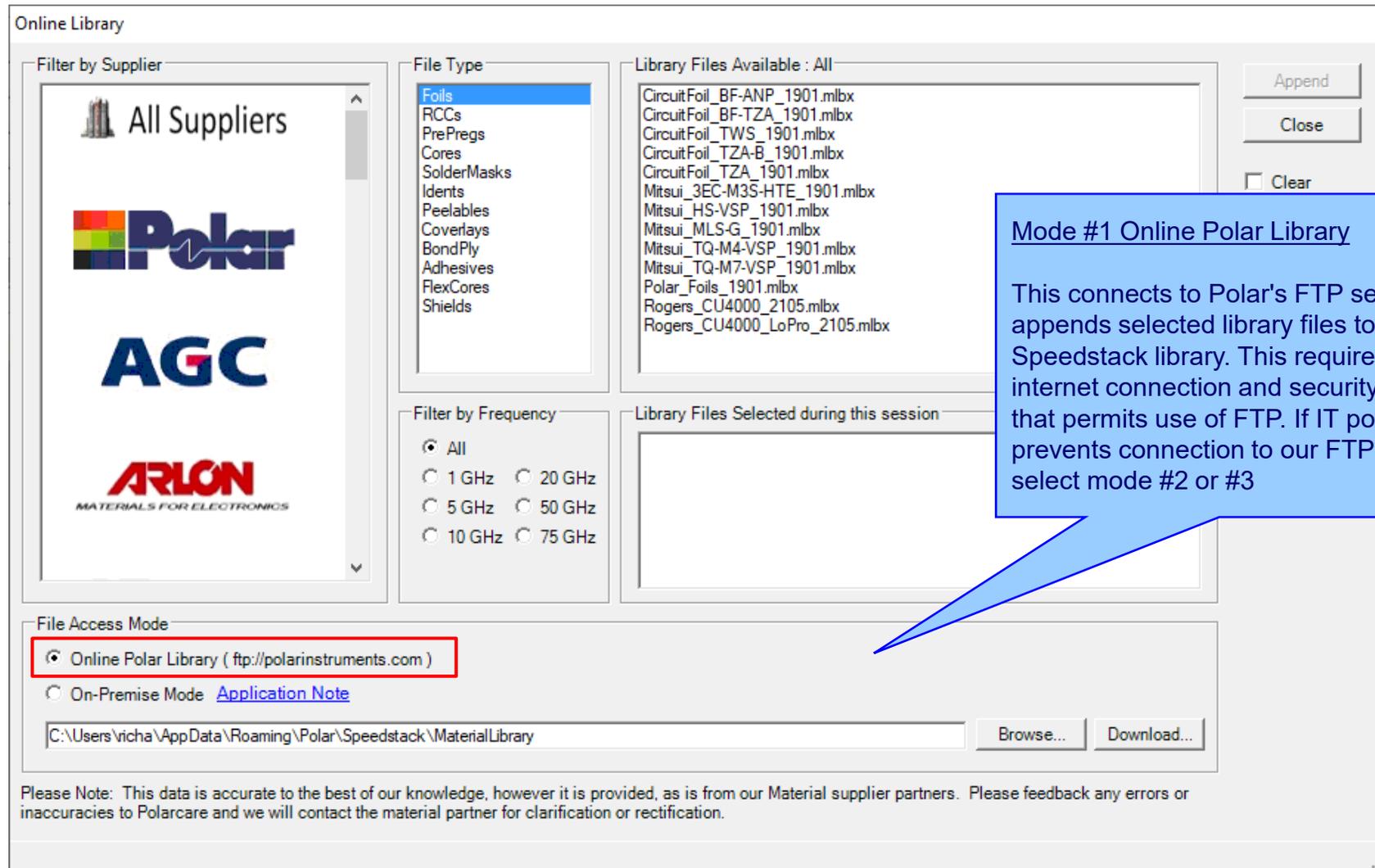


Supplier	Supplier Description	Description	Stock Number	Dielectric Base Thickness	Thickness	Dielectric Constant	Loss Tangent
Polar Samples	PP/001	PrePreg 1080	300-001	3	3	4.2	0.0195
Polar Samples	PP/002	PrePreg 3080	300-002	3			

Example #3

A wildcard search criteria has been specified, search for Prepreg materials where the Description contains '80'. Description Like *80* will search a text / string field for the presence of 80 anywhere in the field

Online Library – Now supports three modes



The screenshot shows the 'Online Library' application window. It features several panels: 'Filter by Supplier' with logos for All Suppliers, Polar, AGC, and ARLO; 'File Type' with a list of file categories like Foils, RCCs, and PrePregs; 'Filter by Frequency' with radio buttons for All, 1 GHz, 5 GHz, 10 GHz, 20 GHz, 50 GHz, and 75 GHz; 'Library Files Available : All' listing various .mlbx files; and 'Library Files Selected during this session' which is currently empty. At the bottom, the 'File Access Mode' section has 'Online Polar Library (ftp://polarinstruments.com)' selected and highlighted with a red box. Below this is a text field containing the local path 'C:\Users\vicha\AppData\Roaming\Polar\Speedstack\MaterialLibrary' and 'Browse...' and 'Download...' buttons. A blue callout box points to the 'File Access Mode' section.

Mode #1 Online Polar Library

This connects to Polar's FTP server and appends selected library files to the existing Speedstack library. This requires an internet connection and security settings that permits use of FTP. If IT policies prevents connection to our FTP server, select mode #2 or #3

Online Library – Now supports three modes

The screenshot shows the 'Online Library' application window. On the left, there is a 'Filter by Supplier' section with logos for 'All Suppliers', 'Polar', 'AGC', and 'ARLON MATERIALS FOR ELECTRONICS'. In the center, there are 'File Type' and 'Filter by Frequency' sections. The 'File Type' list includes Foils, RCCs, PrePregs, Cores, SolderMasks, Idents, Peelables, Coverlays, BondPly, Adhesives, FlexCores, and Shields. The 'Filter by Frequency' section has radio buttons for 'All', '1 GHz', '20 GHz', '5 GHz', '50 GHz', '10 GHz', and '75 GHz'. On the right, there are two lists: 'Library Files Available : All' and 'Library Files Selected during this session'. The 'Available' list contains various .mlbx files from suppliers like CircuitFoil, Mitsui, and Rogers. At the bottom, the 'File Access Mode' section has two radio buttons: 'Online Polar Library (ftp://polarinstruments.com)' and 'On-Premise Mode [Application Note](#)'. The 'On-Premise Mode' option is selected and highlighted with a red box. Below it is a text box containing the path 'C:\Users\vicha\AppData\Roaming\Polar\Speedstack\MaterialLibrary', with 'Browse...' and 'Download...' buttons. The 'Download...' button is also highlighted with a red box. A blue callout box points to the 'On-Premise Mode' option and contains the following text:

Mode #2 On-Premise Mode with Download option (new for 2023)

This option downloads the complete set of On-Premise material libraries so that they are stored locally. It is then possible to append selected library files to the existing Speedstack library. This requires an internet connection but overcomes the problem where FTP access is not permitted as it uses the HTTPS protocol for downloading the complete set of material library files.

Online Library – Now supports three modes

The screenshot shows the 'Online Library' application window. It features several sections: 'Filter by Supplier' with logos for Polar, AGC, and ARON; 'File Type' with a list of material types like Foils, RCCs, and PrePregs; 'Filter by Frequency' with radio buttons for 1 GHz, 5 GHz, 10 GHz, 20 GHz, 50 GHz, and 75 GHz; 'Library Files Available : All' listing various .mlbx files from suppliers like CircuitFoil, Mitsui, and Rogers; and 'Library Files Selected during this session' which is currently empty. At the bottom, the 'File Access Mode' section has two options: 'Online Polar Library (ftp://polarinstruments.com)' and 'On-Premise Mode' (which is selected and highlighted with a red box, with a link to an 'Application Note'). Below this is a text input field containing 'S:\Software\Speedstack\MaterialLibrary' and a 'Browse...' button (also highlighted with a red box) and a 'Download...' button. A blue callout box points to the 'On-Premise Mode' section.

Mode #3 On-Premise Mode with Browse option

A complete set of On-Premise material libraries are supplied as a Zip file, which can be Unzipped to a chosen folder location and then Browse to that location. It is then possible to append selected library files to the existing Speedstack library. This method is suitable where users have no internet connection so options #1 and #2 are not available. Please contact polarcare@polarinstruments.com to receive the Zip file and Unzip to a suitable folder location that is accessible by Speedstack

Speedstack v22.11.01 (November 2022)

Introducing Structure View

Structure View presents a useful overview of the controlled impedance / insertion loss structures that exist on the stack up

Stack Up Thickness = 60.8600 | Stack Up Thickness with Soldermask = 62.8600 | V22.09.01

Target Zo : 50 Single-Ended		Target Zdiff : 100 Differential			
Layer 1, 4, 5, 8		Layer 1, 4, 5, 8			
Zo	W1/W2	Zdiff	W1/W2	S1	W1/W2
1	49.54	99.94	8.0000	8.8200	8.0000
2					
3					
4	49.83	99.55	9.0000	12.0000	9.0000
5	49.83	99.55	10.0000	12.0000	10.0000
6					
7					
8	49.54	99.94	8.0000	8.8200	8.0000

Coated Microstrip 1B

Substrate 1 Height H1: 6.3500
 Substrate 1 Dielectric Er1: 4.2000
 Lower Trace Width W1: 10.9500
 Upper Trace Width W2: 9.9500
 Trace Thickness T1: 1.4000
 Coating Above Substrate C1: 1.0000
 Coating Above Trace C2: 1.0000
 Coating Dielectric CEr: 4.0000

Impedance Zo: 49.54
 Target Impedance: 50.00
 Target Tolerance %: 10.00

The new Structure View is positioned to the right of the existing stack up. All structures are aligned with the stack up electrical layers on which they reside

To access Structure View simply drag the stack up to the left or use the new Show / Hide Structure View tool bar button

Introducing Structure View

Structures are arranged by Target Impedance, low to high, then by Structure Type.

All structures of the same Target Impedance and Structure Type will be positioned in the same column.

In this example there are 8 structures in total:

- 4 x 50 ohm singled-ended (column 1)
- 4 x 100 ohm differential (column 2)

The column header contains the Target Impedance, Structure Type and the layers where the structures reside.

Displaying 8 structures on All Layers

	target Zo : 50 Single-Ended Layer 1, 4, 5, 8	target Zdiff : 100 Differential Layer 1, 4, 5, 8				
	Zo	W1/W2	Zdiff	W1/W2	S1	W1/W2
1	49.54	9.9500 10.9500	99.94	7.0000 8.0000	8.8200	7.0000 8.0000
2						
3						
4	49.83	14.7500 15.7500	99.55	9.0000 10.0000	12.0000	9.0000 10.0000
5	49.83	15.7500 14.7500	99.55	10.0000 9.0000	12.0000	10.0000 9.0000
6						
7						
8	49.54	10.9500 9.9500	99.94	8.0000 7.0000	8.8200	8.0000 7.0000

Edge Coupled Coated Microstrip 1B

Substrate 1 Height	H1	6.3500
Substrate 1 Dielectric	Er1	4.2000
Lower Trace Width	W1	8.0000
Upper Trace Width	W2	7.0000
Trace Separation	S1	8.8200
Trace Thickness	T1	1.4000
Coating Above Substrate	C1	1.0000
Coating Above Trace	C2	1.0000
Coating Between Traces	C3	1.0000
Coating Dielectric	CEr	4.0000
Differential Impedance	Zd	99.94
Target Impedance		100.00

Within the column cell the structure calculated impedance and Lower / Upper Trace Widths (W1 / W2) and Trace Separation (S1) are shown.

The amount of data shown varies depending upon the Structure Type.

Introducing Structure View

Structure View is interactive. Clicking on the golden trace will auto-switch to that structure on the Controlled Impedance tab

The transparent blue highlight reflects the current structure selected on the Controlled Impedance tab

The screenshot shows the 'Stack Up Editor' interface with the 'Controlled Impedance' tab selected. At the top, a navigation bar shows '1 of 8' structures, with a red box highlighting the navigation controls. Below this is a table of 8 structures. Structure 1 is highlighted with a transparent blue background. To the right, a 'Coated Microstrip 1B' diagram shows a cross-section of the structure with parameters like H1, Er1, W1, W2, C1, C2, and CEr. Below the diagram is a parameter table.

Target Zo : 50	Target Zdiff : 100				
Single-Ended	Differential				
Layer 1, 4, 5, 8	Layer 1, 4, 5, 8				
Zo	W1/W2	Zdiff	W1/W2	S1	W1/W2
1 49.54	9.9500 10.9500	99.94	7.0000 8.0000	8.8200	7.0000 8.0000
2					
4 49.83	14.7500 15.7500	99.55	9.0000 10.0000	12.0000	9.0000 10.0000
5 49.83	15.7500 14.7500	99.55	10.0000 9.0000	12.0000	10.0000 9.0000
6					
7					
8 49.54	10.9500 9.9500	99.94	8.0000 7.0000	8.8200	8.0000 7.0000

Substrate 1 Height	H1	6.3500
Substrate 1 Dielectric	Er1	4.2000
Lower Trace Width	W1	10.9500
Upper Trace Width	W2	9.9500
Trace Thickness	T1	1.4000
Coating Above Substrate	C1	1.0000
Coating Above Trace	C2	1.0000
Coating Dielectric	CEr	4.0000
Impedance	Zo	49.54
Target Impedance		50.00
Target Tolerance %		10.00

Browsing through the structures on the Controlled Impedance tab will auto highlight the structure on Structure View

Introducing Structure View

Clicking the 'Filter by Layer' updates the view to show just structures on layer 4

Filtering structures by layer is useful when focusing on critical layers of the stack up.
In this example layer 4 has been selected

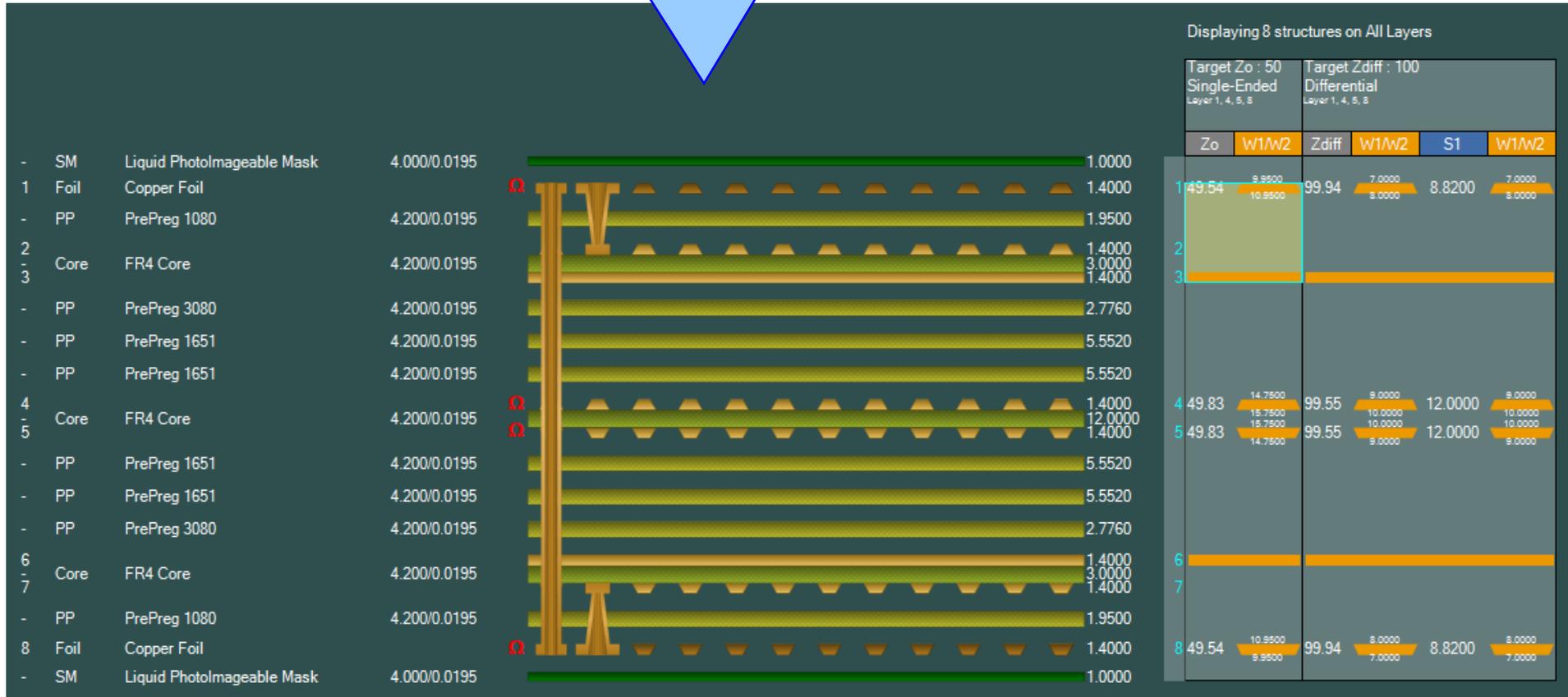
The screenshot shows the Polar Speedstack Stack Up Builder interface. The main window displays a stack up of 8 layers. Layer 4 is highlighted in orange, and its structures are shown in a detailed view on the right. The detailed view shows a microstrip structure on a substrate with parameters: Substrate 1 Height (H1) 27.2800, Substrate 1 Dielectric (Er1) 4.2000, Substrate 2 Height (H2) 15.2800, Substrate 2 Dielectric (Er2) 4.2000, Lower Trace Width (W1) 15.7500, Upper Trace Width (W2) 14.7500, and Trace Thickness (T1) 1.4000. The impedance target is 50.00 with a 10.00% tolerance.

Layer	Zo	W1/W2	Zdiff	W1/W2	S1	W1/W2
1						
2						
3						
4	49.83	14.7500 / 15.7500	99.55	9.0000 / 10.0000	12.0000	9.0000 / 10.0000
5						
6						
7						
8						

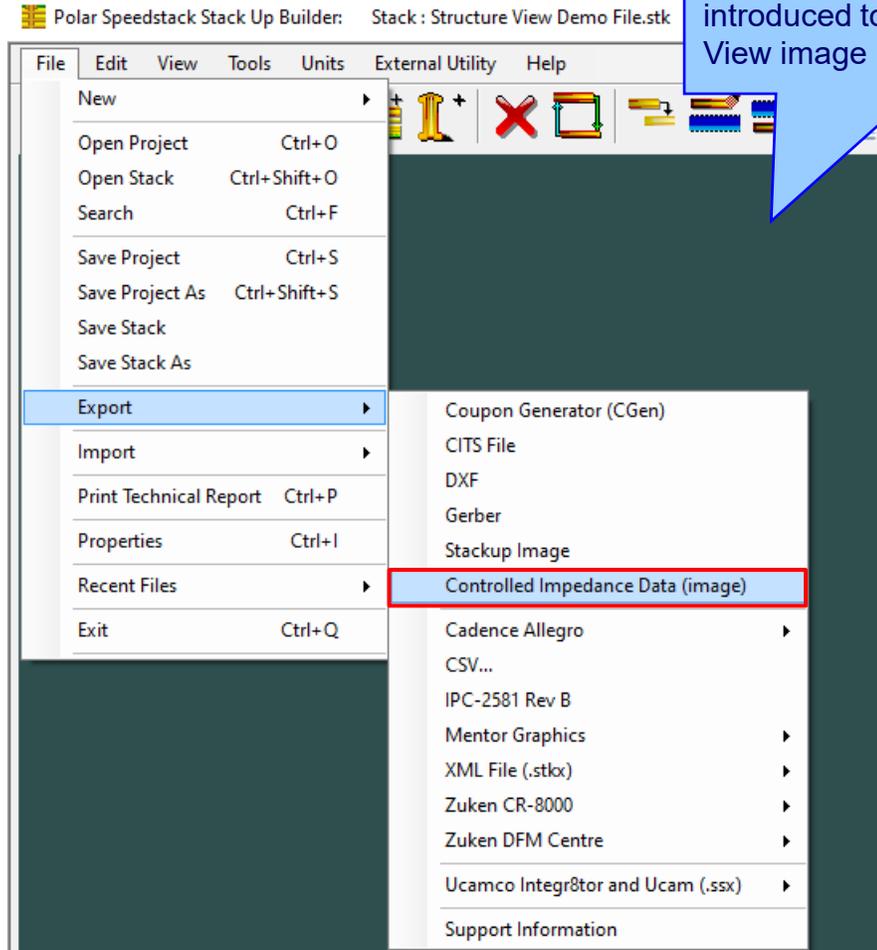
Introducing Structure View

Use the mouse wheel to zoom out and show the complete stack up together with the structures.

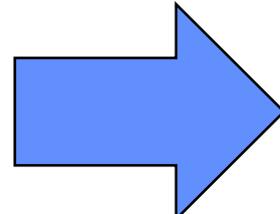
All data is now visible in one view



Introducing Structure View



A new File | Export | Controlled Impedance Data option has been introduced to export the Structure View image



Displaying 8 structures on All Layers

Target Zo : 50 Single-Ended Layer 1, 4, 5, 8		Target Zdiff : 100 Differential Layer 1, 4, 5, 8				
	Zo	W1/W2	Zdiff	W1/W2	S1	W1/W2
1	49.54	9.9500 10.9500	99.94	7.0000 8.0000	8.8200	7.0000 8.0000
2						
3						
4	49.83	14.7500 15.7500	99.55	9.0000 10.0000	12.0000	9.0000 10.0000
5	49.83	15.7500 14.7500	99.55	10.0000 9.0000	12.0000	10.0000 9.0000
6						
7						
8	49.54	10.9500 9.9500	99.94	8.0000 7.0000	8.8200	8.0000 7.0000

Online Library enhancements

The screenshot displays the 'Online Library' interface with the following sections:

- Filter by Supplier:** A scrollable list of suppliers including Nan Ya Plastics, Nelco, **OAK-MITSUI TECHNOLOGIES** (highlighted with a red box), and Panasonic.
- File Type:** A list of material types such as Foils, RCCs, PrePregs, Cores (selected), SolderMasks, Idents, Peelables, Coverlays, BondPly, Adhesives, FlexCores, and Shields.
- Filter by Frequency:** Radio buttons for 'All', '1 GHz', '20 GHz', and '50 GHz'.
- Library Files Available : OakMitsui:** A list of files including 'OakMitsui_FaradFlex_MC12M_1GHz_2201.mlbx', 'OakMitsui_FaradFlex_MC12M_1MHz_2201.mlbx', 'OakMitsui_FaradFlex_MC12TM_1GHz_2201.mlbx', 'OakMitsui_FaradFlex_MC12TM_1MHz_2201.mlbx', 'OakMitsui_FaradFlex_MC24M_1GHz_2201.mlbx', 'OakMitsui_FaradFlex_MC24M_1MHz_2201.mlbx', 'OakMitsui_FaradFlex_MC24P_1MHz_2201.mlbx', 'OakMitsui_FaradFlex_MC8M_1GHz_2201.mlbx', 'OakMitsui_FaradFlex_MC8M_1MHz_2201.mlbx', and 'OakMitsui_FaradFlex_MC8TM_1GHz_2201.mlbx'.
- Existing Data Table:** Radio buttons for 'Clear' and 'Append' (selected). Below are instructions: 'Clear - use this option to clear data from the existing library data table and download a single library' and 'Append - use this option to add data to the existing library data table and when downloading multiple libraries during a single session'. 'Download' and 'Close' buttons are present.
- Library Files Downloaded during this session:** An empty list box.
- File Access Mode:** Radio buttons for 'Online Polar Library (ftp://polarinstruments.com)' (selected) and 'On-Premise Mode [Application Note](#)'. A text field contains 'C:\Users\vicha\Desktop\Material_Library_2021' with a 'Browse...' button.

Please Note: This data is accurate to the best of our knowledge, however it is provided, as is from our Material supplier partners. Please feedback any errors or inaccuracies to Polarcare and we will contact the material partner for clarification or rectification.

Regular updates of materials and suppliers

Speedstack v22.07.20 (July 2022)

Introducing Grid View

Grid View presents the current stack up in an editable data grid form to allow for easy editing of multiple materials from a single dialog

Grid View

Stack Up Collection Index	Material Class	Material Element	Electrical Layer	Material Layer Type ID	Layer Name	Description	Processed Thickness	Dielectric Constant	Loss Tangent
0	CSTSolderMask	Mask		SM		Liquid Photoimageable Mask	1.0000	4.0000	0.0195
1	CSTFoil	Copper	1	Foil	Top	Copper Foil	1.4000		
2	CSTPrePreg	Dielectric		PP		PrePreg 1080	1.9500	4.2000	0.0195
3	CSTCore	UpperCopper	2		Inner 2		1.4000		
3	CSTCore	Dielectric		Core		FR4 Core	3.0000	4.2000	0.0195
3	CSTCore	LowerCopper	3		Inner 3		1.4000		
4	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.7760	4.2000	0.0195
5	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
6	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
7	CSTCore	UpperCopper	4		Inner 4		1.4000		
7	CSTCore	Dielectric		Core		FR4 Core	12.0000	4.2000	0.0195
7	CSTCore	LowerCopper	5		Inner 5		1.4000		
8	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
9	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
10	CSTPrePreg	Dielectric				PrePreg 3080	2.7760	4.2000	0.0195
11	CSTCore	UpperCopper			Inner 6		1.4000		
						FR4 Core	3.0000	4.2000	0.0195
					Inner 7		1.4000		
						PrePreg 1080	1.9500	4.2000	0.0195
					Bottom	Copper Foil	1.4000		
						Liquid Photoimageable Mask	1.0000	4.0000	0.0195

Apply Cancel

Grid View allows for quick editing of key stack up information such as Material Description, Processed Thickness, Dielectric Constant and Loss Tangent.

The stack up data from Grid View can also be edited in Microsoft Excel using the Grid View copy and paste functions

Changes in Grid View can be saved back to the original stack up design

Introducing Grid View

Grid View
— □ ×

Stack Up Collection Index	Material Class	Material Element	Electrical Layer	Material Type	Layer Name	Description	Processed Thickness	Dielectric Constant	Loss Tangent
0	CSTSolderMask	Mask		SM			1.0000	4.0000	0.0195
1	CSTFoil	Copper	1	Foil			1.4000		
2	CSTPrePreg	Dielectric		PP			1.9500	4.2000	0.0195
3	CSTCore	UpperCopper	2		Inner 2		1.4000		
3	CSTCore	Dielectric		Core		FR4 Core	3.0000	4.2000	0.0195
3	CSTCore	LowerCopper	3		Inner 3		1.4000		
4	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.7760	4.2000	0.0195
5	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
6	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
7	CSTCore	UpperCopper	4		Inner 4		1.4000		
7	CSTCore	Dielectric		Core		FR4 Core	12.0000	4.2000	0.0195
7	CSTCore	LowerCopper	5		Inner 5		1.4000		
8	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
9	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
10	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.7760	4.2000	0.0195
11	CSTCore	UpperCopper	6		Inner 6		1.4000		
11	CSTCore	Dielectric		Core		FR4 Core	3.0000	4.2000	0.0195
11	CSTCore	LowerCopper	7		Inner 7		1.4000		
12	CSTPrePreg	Dielectric		PP		PrePreg 1080	1.9500	4.2000	0.0195
13	CSTFoil	Copper	8	Foil	Bottom	Copper Foil	1.4000		
14	CSTSolderMask	Mask		SM		Liquid Photoimageable Mask	1.0000	4.0000	0.0195

NOTE: In order to preserve stack integrity – some fields are locked.

Use the right-click menu to copy / paste the Grid View to the clipboard - the data may then be edited with Excel
 Layer Name, Description, Processed Thickness, Dielectric Constant and Loss Tangent columns are editable, other columns are read-only
 Processed Thickness = Copper.FinishedThickness, Dielectric.IsolationDistance, SolderMask.MaskThickness, Coverlay.FinishedThickness

Introducing Grid View

Grid View has many uses, some are highlighted here:

1. Key information for the whole stack up can be edited from a single dialog / screen
2. If changes to the original stack up design are made by the fabricator during the manufacturing stage, these can be quickly evaluated by updating the Processed Thickness, Dielectric Constant and Loss Tangent cells. The impact of these changes on stack up thickness, controlled impedance and insertion loss calculations can then be quickly evaluated
3. Plated layer thicknesses can be adjusted quickly and easily
4. Layer Names can be quickly assigned to electrical layers

Stack Up Collection Index	Material Class	Material Element	Electrical Layer	Material Layer Type ID	Layer Name	Processed Thickness	Dielectric Constant	Loss Tangent
0	CSTSolderMask	Mask		SM				
1	CSTFoil	Copper	1	Foil	Top		4.0000	0.0195
2	CSTPrePreg	Dielectric		PP			4.2000	0.0195
3	CSTCore	UpperCopper	2		Inner			
3	CSTCore	Dielectric		Core			4.2000	0.0195
3	CSTCore	LowerCopper	3		Inner			
4	CSTPrePreg	Dielectric		PP			4.2000	0.0195
5	CSTPrePreg	Dielectric		PP			4.2000	0.0195
6	CSTPrePreg	Dielectric		PP		5.5520	4.2000	0.0195
7	CSTCore	UpperCopper	4		Inner 4	1.4000		
7	CSTCore	Dielectric		Core		FR4 Core	12.0000	4.2000
7	CSTCore	LowerCopper	5		Inner 5	1.4000		
8	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000
9	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000
10	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.7760	4.2000
11	CSTCore	UpperCopper	6		Inner 6	1.4000		
11	CSTCore	Dielectric		Core		FR4 Core	3.0000	4.2000
11	CSTCore	LowerCopper	7		Inner 7	1.4000		
12	CSTPrePreg	Dielectric		PP		PrePreg 1080	1.9500	4.2000
13	CSTFoil	Copper	8	Foil	Bottom	Copper Foil	1.4000	
14	CSTSolderMask	Mask		SM		Liquid Photoimageable Mask	1.0000	4.0000

Use the right-click menu to copy / paste the Grid View to the clipboard - the data may then be edited with Excel
 Layer Name, Description, Processed Thickness, Dielectric Constant and Loss Tangent columns are editable, other columns are read-only
 Processed Thickness = Copper.FinishedThickness, Dielectric.IsolationDistance, SolderMask.MaskThickness, Coverlay.FinishedThickness

Apply Cancel

Grid View – Walkthrough Step #1

Step #1
An 8 layer stack up is loaded into the Speedstack editor. To examine and edit this stack up in Grid View select the new toolbar button

Stack Up Builder Stack: Eval Imperial.stk Project: Eval Imperial.sci

Layer	Material	Thickness	Order
-	SM	Liquid PhotoImageable Mask	4.000/0.0195
1	Foil	Copper Foil	1.4000
-	PP	PrePreg 1080	4.200/0.0195
2	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 3080	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
4	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
-	PP	PrePreg 3080	4.200/0.0195
6	Core	FR4 Core	4.200/0.0195
7	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
8	Foil	Copper Foil	1.4000
-	SM	Liquid PhotoImageable Mask	4.000/0.0195

Parameter	Value
Substrate 1 Height	H1 6.3500
Substrate 1 Dielectric	Er1 4.2000
Lower Trace Width	W1 7.6500
Upper Trace Width	W2 6.6500
Trace Separation	S1 8.1150
Trace Thickness	T1 1.4000
Coating Above Substrate	C1 1.0000
Coating Above Trace	C2 1.0000
Coating Between Traces	C3 1.0000
Coating Dielectric	CEr 4.0000
Differential Impedance	Zd 100.29
Target Impedance	100.00
Target Tolerance %	10.00

Grid View – Walkthrough Step #2

Step #2
Using the Grid View editor the following cells are amended. Layer Names have been changed and Processed Thickness adjusted

Grid View

Stack Up Collection Index	Material Class	Material Element	Electrical Layer	Material Layer Type ID	Layer Name	Description	Processed Thickness	Dielectric Constant	Loss Tangent
0	CSTSolderMask	Mask		SM		Liquid PhotoImageable Mask	1.0000	4.0000	0.0195
1	CSTFoil	Copper	1	Foil	Top	Copper Foil	1.4000		
2	CSTPrePreg	Dielectric		PP		PrePreg 1080	1.9500	4.2000	0.0195
3	CSTCore	UpperCopper	2		Inner 2		1.4000		
3	CSTCore	Dielectric		Core		FR4 Core	3.0000	4.2000	0.0195
3	CSTCore	LowerCopper	3		Power		1.4000		
4	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.5000	4.2000	0.0195
5	CSTPrePreg	Dielectric		PP		PrePreg 1651	2.5000	4.2000	0.0195
6	CSTPrePreg	Dielectric		PP		PrePreg 1651	6.0000	4.2000	0.0195
7	CSTCore	UpperCopper	4		Inner 4		1.4000		
7	CSTCore	Dielectric		Core		FR4 Core	12.0000	4.2000	0.0195
7	CSTCore	LowerCopper	5		Inner 5		1.4000		
8	CSTPrePreg	Dielectric		PP		PrePreg 1651	6.0000	4.2000	0.0195
9	CSTPrePreg	Dielectric		PP		PrePreg 1651	6.0000	4.2000	0.0195
10	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.5000	4.2000	0.0195
11	CSTCore	UpperCopper	6		Ground		1.4000		
11	CSTCore	Dielectric		Core		FR4 Core	3.0000	4.2000	0.0195
11	CSTCore	LowerCopper	7		Inner 7		1.4000		
12	CSTPrePreg	Dielectric		PP		PrePreg 1080	1.9500	4.2000	0.0195
13	CSTFoil	Copper	8	Foil	Bottom	Copper Foil	1.4000		
14	CSTSolderMask	Mask		SM		Liquid PhotoImageable Mask	1.0000	4.0000	0.0195

Use the right-click menu to copy / paste the Grid View to the clipboard - the data may then be edited with Excel
 Layer Name, Description, Processed Thickness, Dielectric Constant and Loss Tangent columns are editable, other columns are read only
 Processed Thickness = Copper.FinishedThickness, Dielectric.IsolationDistance, SolderMask.MaskThickness, Coverlay.FinishedThickness

Apply Cancel

Selecting Apply will save the changes back to the stack up editor

Grid View – Walkthrough Step #3

The screenshot shows the Polar Speedstack Stack Up Builder interface. The main window displays a grid view of the PCB stack-up layers. The layers are listed in a table on the left, and a 3D visualization of the stack-up is shown in the center. The right-hand panel contains various information panels, including 'Stack Up Information' and 'Selected Item Information: Core'. A red box highlights the 'Layer Name' field in the 'Selected Item Information' panel, which is set to 'Power'. Another red box highlights the 'Processed Thickness' column in the layer list, showing values like 1.4000 and 2.5000. A third red box highlights the 'Layer Name' field in the 'Selected Item Information' panel, which is set to 'Power'.

Layer	Material	Thickness	Processed Thickness
- SM	Liquid Photoimageable Mask	4.000/0.0195	1.0000
1	Foil Copper Foil		1.4000
- PP	PrePreg 1080	4.200/0.0195	1.9500
2	Core FR4 Core	4.200/0.0195	1.4000
3	Core FR4 Core	4.200/0.0195	3.0000
			1.4000
- PP	PrePreg 3080	4.200/0.0195	2.5000
- PP	PrePreg 1651	4.200/0.0195	2.5000
- PP	PrePreg 1651	4.200/0.0195	6.0000
4	Core FR4 Core	4.200/0.0195	1.4000
5	Core FR4 Core	4.200/0.0195	12.0000
			1.4000
- PP	PrePreg 1651	4.200/0.0195	6.0000
- PP	PrePreg 1651	4.200/0.0195	6.0000
- PP	PrePreg 3080	4.200/0.0195	2.5000
6	Core FR4 Core	4.200/0.0195	1.4000
7	Core FR4 Core	4.200/0.0195	3.0000
			1.4000
- PP	PrePreg 1080	4.200/0.0195	1.9500
8	Foil Copper Foil		1.4000
- SM	Liquid Photoimageable Mask	4.000/0.0195	1.0000

Step #3
Changes made under Grid View are now applied back to the stack up editor.

Layer Name change

Processed Thickness adjustments

Using Grid View with Microsoft Excel – Step #1

Step #1
From within Grid View use the right-click menu and select the Copy to Clipboard option.

The screenshot shows the 'Grid View' window in the Polar Speedstack Stack Up Builder. The window contains a table with the following columns: Stack Up Collection Index, Material Class, Material Element, Electrical Layer, Material Layer Type ID, Layer Name, Description, Processed Thickness, Dielectric Constant, and Loss Tangent. A context menu is open over the row with index 6, showing options for 'Copy to Clipboard (for Excel)' and 'Paste from Clipboard (from Excel)'. The 'Copy to Clipboard (for Excel)' option is highlighted with a red box.

Stack Up Collection Index	Material Class	Material Element	Electrical Layer	Material Layer Type ID	Layer Name	Description	Processed Thickness	Dielectric Constant	Loss Tangent
0	CSTSolderMask	Mask		SM		Liquid PhotoImageable Mask	1.0000	4.0000	0.0195
1	CSTFoil	Copper	1	Foil	Top	Copper Foil	1.4000		
2	CSTPrePreg	Dielectric		PP		PrePreg 1080	1.9500	4.2000	0.0195
3	CSTCore	UpperCopper	2		Inner 2		1.4000		
3	CSTCore	Dielectric		Core		FR4 Core	3.0000	4.2000	0.0195
3	CSTCore	LowerCopper	3		Inner 3		1.4000		
4	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.7760	4.2000	0.0195
5	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
6	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
7	CSTCore	UpperCopper	4		Inner 4		1.4000		
7	CSTCore	Dielectric		Core		FR4 Core	12.0000	4.2000	0.0195
7	CSTCore	LowerCopper	5		Inner 5		1.4000		
8	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
9	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
10	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.7760	4.2000	0.0195
11	CSTCore	UpperCopper	6		Inner 6		1.4000		
11	CSTCore	Dielectric		PP		FR4 Core	3.0000	4.2000	0.0195
11	CSTCore	LowerCopper			Inner 7		1.4000		
						PrePreg 1080	1.9500	4.2000	0.0195
					Bottom	Copper Foil	1.4000		
						Liquid PhotoImageable Mask	1.0000	4.0000	0.0195

The Copy / Paste options allow for the contents of Grid View to be passed to Excel, make changes either by copying existing data from other spreadsheets or editing using the power of Excel, then paste the resultant Excel data back to Grid View.

Using Grid View with Microsoft Excel – Step #2

Step #2
Open Excel and paste the clipboard contents to a worksheet

Stack Up Collection Index	Material Class	Material Element	Electrical Layer	Material Layer Type ID	Layer Name	Description	Processed Thickness	Dielectric Constant	Loss Tangent
0	CSTSolderMask	Mask		SM		Liquid PhotoImageable Mask	1	4	0.0195
1	CSTFoil	Copper	1	Foil	Top	Copper Foil	1.4		
2	CSTPrePreg	Dielectric		PP		PrePreg 1080	1.95	4.2	0.0195
3	CSTCore	UpperCopper	2		Inner 2		1.4		
3	CSTCore	Dielectric		Core		FR4 Core	3	4.2	0.0195
3	CSTCore	LowerCopper	3		Inner 3		1.4		
4	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.776	4.2	0.0195
5	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.552	4.2	0.0195
6	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.552	4.2	0.0195
7	CSTCore	UpperCopper	4		Inner 4		1.4		
7	CSTCore	Dielectric		Core		FR4 Core	12	4.2	0.0195
7	CSTCore	LowerCopper	5		Inner 5		1.4		
8	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.552	4.2	0.0195
9	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.552	4.2	0.0195
10	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.776	4.2	0.0195
11	CSTCore	UpperCopper	6		Inner 6		1.4		
11	CSTCore	Dielectric		Core		FR4 Core	3	4.2	0.0195
11	CSTCore	LowerCopper	7		Inner 7		1.4		
12	CSTPrePreg	Dielectric		PP		PrePreg 1080	1.95	4.2	0.0195
13	CSTFoil	Copper	8	Foil	Bottom	Copper Foil	1.4		
14	CSTSolderMask	Mask		SM		Liquid PhotoImageable Mask	1	4	0.0195

Using Grid View with Microsoft Excel – Step #3

Step #3
The Processed Thickness cells highlighted in red have been changed

Stack Up Collection Index	Material Class	Material Element	Electrical Layer	Material Layer Type ID	Layer Name	Description	Processed Thickness	Dielectric Constant	Loss Tangent
0	CSTSolderMask	Mask		SM		Liquid PhotoImageable Mask	1	4	0.0195
1	CSTFoil	Copper	1	Foil	Top	Copper Foil	1.5		
2	CSTPrePreg	Dielectric		PP		PrePreg 1080	2.1	4.2	0.0195
3	CSTCore	UpperCopper	2		Inner 2		1.4		
3	CSTCore	Dielectric		Core		FR4 Core	3	4.2	0.0195
3	CSTCore	LowerCopper	3		Inner 3		1.4		
4	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.776	4.2	0.0195
5	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.552	4.2	0.0195
6	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.552	4.2	0.0195
7	CSTCore	UpperCopper	4		Inner 4		1.4		
7	CSTCore	Dielectric		Core		FR4 Core	10	4.2	0.0195
7	CSTCore	LowerCopper	5		Inner 5		1.4		
8	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.552	4.2	0.0195
9	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.552	4.2	0.0195
10	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.776	4.2	0.0195
11	CSTCore	UpperCopper	6		Inner 6		1.4		
11	CSTCore	Dielectric		Core		FR4 Core	3	4.2	0.0195
11	CSTCore	LowerCopper	7		Inner 7		1.4		
12	CSTPrePreg	Dielectric		PP		PrePreg 1080	2.1	4.2	0.0195
13	CSTFoil	Copper	8	Foil	Bottom	Copper Foil	1.5		
14	CSTSolderMask	Mask		SM		Liquid PhotoImageable Mask	1	4	0.0195

NOTE: In order to preserve stack integrity, materials should not be added or removed at this step. Add/remove of materials needs to be performed in the Speedstack editor to allow validation to be performed.

Using Grid View with Microsoft Excel – Step #4

Step #4
Once the Excel changes are complete select the range of cells representing the whole stack up data and select Copy

The screenshot shows the Microsoft Excel interface with the 'Home' ribbon selected. The 'Copy' button in the Clipboard group is highlighted with a red box. A blue callout box points to the 'Copy' button with the text 'Step #4 Once the Excel changes are complete select the range of cells representing the whole stack up data and select Copy'.

Stack Up Collection Index	Material Class	Material Element	Electrical Layer	Material Layer Type ID	Layer Name	Description	Processed Thickness	Dielectric Constant	Loss Tangent
0	CSTSolderMask	Mask		SM		Liquid PhotoImageable Mask	1	4	0.0195
1	CSTFoil	Copper	1	Foil	Top	Copper Foil	1.5		
2	CSTPrePreg	Dielectric		PP		PrePreg 1080	2.1	4.2	0.0195
3	CSTCore	UpperCopper	2		Inner 2		1.4		
3	CSTCore	Dielectric		Core		FR4 Core	3	4.2	0.0195
3	CSTCore	LowerCopper	3		Inner 3		1.4		
4	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.776	4.2	0.0195
5	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.552	4.2	0.0195
6	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.552	4.2	0.0195
7	CSTCore	UpperCopper	4		Inner 4		1.4		
7	CSTCore	Dielectric		Core		FR4 Core	10	4.2	0.0195
7	CSTCore	LowerCopper	5		Inner 5		1.4		
8	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.552	4.2	0.0195
9	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.552	4.2	0.0195
10	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.776	4.2	0.0195
11	CSTCore	UpperCopper	6		Inner 6		1.4		
11	CSTCore	Dielectric		Core		FR4 Core	3	4.2	0.0195
11	CSTCore	LowerCopper	7		Inner 7		1.4		
12	CSTPrePreg	Dielectric		PP		PrePreg 1080	2.1	4.2	0.0195
13	CSTFoil	Copper	8	Foil	Bottom	Copper Foil	1.5		
14	CSTSolderMask	Mask		SM		Liquid PhotoImageable Mask	1	4	0.0195

Using Grid View with Microsoft Excel – Step #5

Step #5
 Back in Grid View select the right-click menu Paste from Clipboard option and Grid View will update with the data from Excel. Notice how the data now matches Excel

Grid View

Stack Up Collection Index	Material Class	Material Element	Electrical Layer	Material Layer Type ID	Layer Name	Description	Processed Thickness	Dielectric Constant	Loss Tangent
0	CSTSolderMask	Mask		SM		Liquid PhotoImageable Mask	1.0000	4.0000	0.0195
1	CSTFoil	Copper	1	Foil	Top	Copper Foil	1.5000		
2	CSTPrePreg	Dielectric		PP		PrePreg 1080	2.1000	4.2000	0.0195
3	CSTCore	UpperCopper	2		Inner 2		1.4000		
3	CSTCore	Dielectric		Core		FR4 Core	3.0000	4.2000	0.0195
3	CSTCore	LowerCopper	3		Inner 3		1.4000		
4	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.7760	4.2000	0.0195
5	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
6	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
7	CSTCore	UpperCopper	4		Inner 4		1.4000		
7	CSTCore	Dielectric		Core		FR4 Core	10.0000	4.2000	0.0195
7	CSTCore	LowerCopper	5		Inner 5		1.4000		
8	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
9	CSTPrePreg	Dielectric		PP		PrePreg 1651	5.5520	4.2000	0.0195
10	CSTPrePreg	Dielectric		PP		PrePreg 3080	2.7760	4.2000	0.0195
11	CSTCore	UpperCopper	6		Inner 6		1.4000		
11	CSTCore	Dielectric		Core		FR4 Core	3.0000	4.2000	0.0195
11	CSTCore	LowerCopper	7		Inner 7		1.4000		
12	CSTPrePreg	Dielectric		PP		PrePreg 1080	2.1000	4.2000	0.0195
13	CSTFoil	Copper	8	Foil	Bottom	Copper Foil	1.5000		
14	CSTSolderMask	Mask		SM		Liquid PhotoImageable Mask	1.0000	4.0000	0.0195

Use the right-click menu to copy / paste the Grid View to the clipboard - the data may then be edited with Excel
 Layer Name, Description, Processed Thickness, Dielectric Constant and Loss Tangent columns are editable, other columns are read-only
 Processed Thickness = Copper.FinishedThickness, Dielectric.IsolationDistance, SolderMask.MaskThickness, Coverlay.FinishedThickness

Apply Cancel

Using Grid View with Microsoft Excel – Step #6

Step #6
 Selecting Apply in Grid View will update the stack up with the data that was originally changed in Excel

Stack Up Editor | DRC : 0 | Controlled Impedance

Stack Up Notes (enter text here to be printed on the stack up)

Field	Value
Electrical Layer Count	8
Stack Up Cost	54.00
Copper Thickness	11.4000
Dielectric Thickness	47.9600
Solder Mask Thickness	2.0000
=====	
Target Stack Up Thickness	60.0000
Stack Up Thickness	59.3600
Stack Up Thickness with Soldermask	61.3600
=====	

Selected Item Information

Layer	Material	Thickness	Cumulative Thickness	
-	SM	Liquid PhotoImageable Mask	4.000/0.0195	1.0000
1	Foil	Copper Foil	4.200/0.0195	1.5000
-	PP	PrePreg 1080	4.200/0.0195	2.1000
2	Core	FR4 Core	4.200/0.0195	1.4000
-	PP	PrePreg 3080	4.200/0.0195	3.0000
3	Core	FR4 Core	4.200/0.0195	1.4000
-	PP	PrePreg 1651	4.200/0.0195	2.7760
-	PP	PrePreg 1651	4.200/0.0195	5.5520
-	PP	PrePreg 1651	4.200/0.0195	5.5520
4	Core	FR4 Core	4.200/0.0195	1.4000
-	PP	PrePreg 1651	4.200/0.0195	10.0000
5	Core	FR4 Core	4.200/0.0195	1.4000
-	PP	PrePreg 1651	4.200/0.0195	5.5520
-	PP	PrePreg 1651	4.200/0.0195	5.5520
-	PP	PrePreg 3080	4.200/0.0195	2.7760
6	Core	FR4 Core	4.200/0.0195	1.4000
7	Core	FR4 Core	4.200/0.0195	3.0000
-	PP	PrePreg 1080	4.200/0.0195	1.4000
-	PP	PrePreg 1080	4.200/0.0195	2.1000
8	Foil	Copper Foil	4.200/0.0195	1.5000
-	SM	Liquid PhotoImageable Mask	4.000/0.0195	1.0000

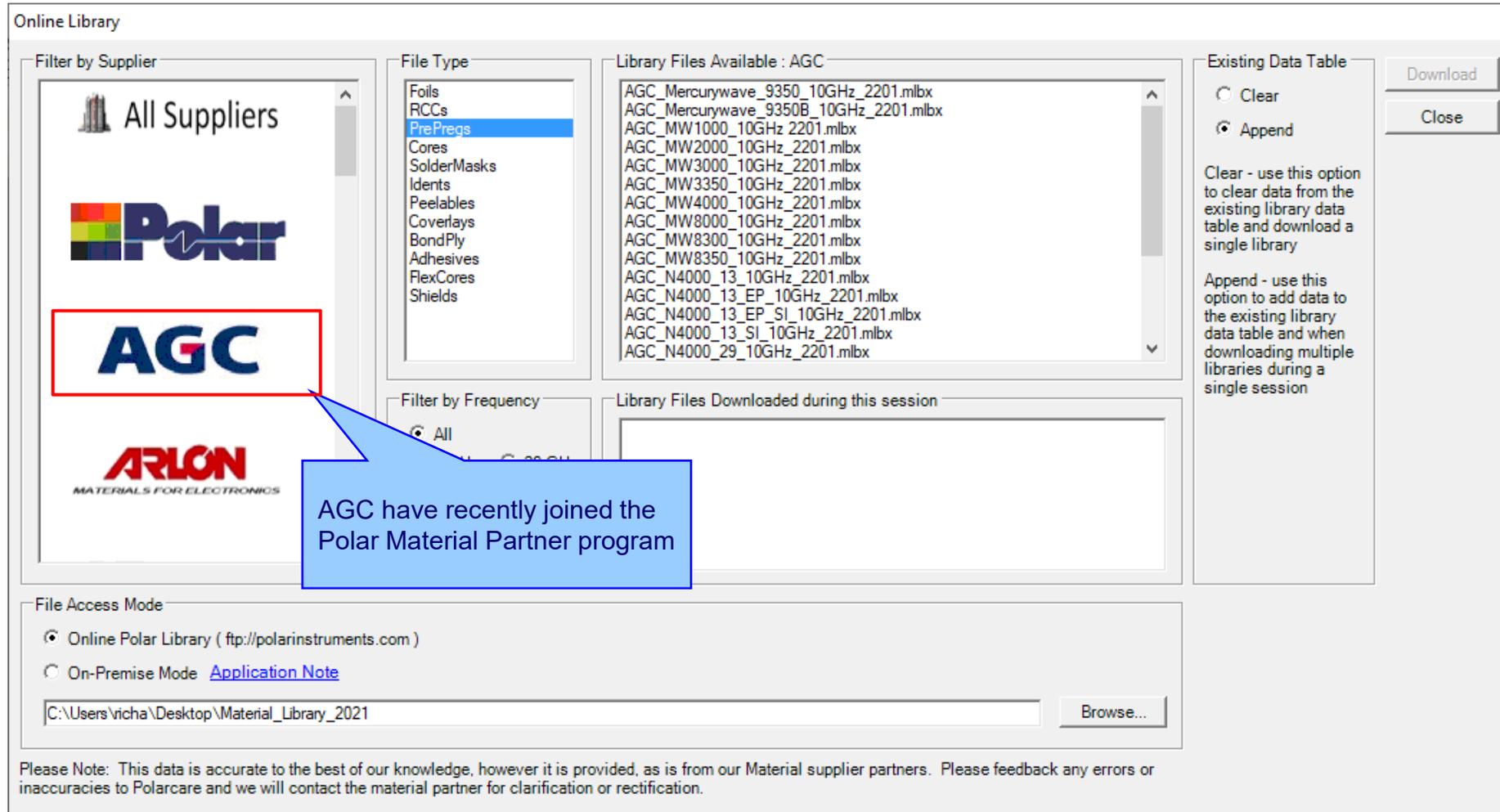
Master | Mils/Thous | Target Stack Up Thickness = 60.0000 | Stack Up Thickness = 59.3600 | Stack Up Thickness with Soldermask = 61.3600 | V22.07.20

Other enhancements

- Stack Up Notes user interface improvements
- The Tools | Options | Structure Defaults | Separation Region Dielectric (REr) now supports double data types. Previously, it only supported integers

Speedstack v22.05.06 (May 2022)

Online Library enhancements



The screenshot shows the 'Online Library' interface. On the left, under 'Filter by Supplier', the 'AGC' logo is highlighted with a red box. A blue callout bubble points to it with the text: 'AGC have recently joined the Polar Material Partner program'. The 'File Type' list includes 'PrePregs' which is selected. The 'Library Files Available : AGC' list contains various .mlbx files. The 'Existing Data Table' section has 'Append' selected. At the bottom, 'File Access Mode' is set to 'Online Polar Library (ftp://polarinstruments.com)' and a local path is entered in the 'Browse...' field.

Online Library

Filter by Supplier

All Suppliers

Polar

AGC

ARLON
MATERIALS FOR ELECTRONICS

File Type

- Foils
- RCCs
- PrePregs
- Cores
- SolderMasks
- Idents
- Peelables
- Coverlays
- BondPly
- Adhesives
- FlexCores
- Shields

Filter by Frequency

- All

Library Files Available : AGC

- AGC_Mercurywave_9350_10GHz_2201.mlbx
- AGC_Mercurywave_9350B_10GHz_2201.mlbx
- AGC_MW1000_10GHz_2201.mlbx
- AGC_MW2000_10GHz_2201.mlbx
- AGC_MW3000_10GHz_2201.mlbx
- AGC_MW3350_10GHz_2201.mlbx
- AGC_MW4000_10GHz_2201.mlbx
- AGC_MW8000_10GHz_2201.mlbx
- AGC_MW8300_10GHz_2201.mlbx
- AGC_MW8350_10GHz_2201.mlbx
- AGC_N4000_13_10GHz_2201.mlbx
- AGC_N4000_13_EP_10GHz_2201.mlbx
- AGC_N4000_13_EP_SI_10GHz_2201.mlbx
- AGC_N4000_13_SI_10GHz_2201.mlbx
- AGC_N4000_29_10GHz_2201.mlbx

Existing Data Table

Clear

Append

Clear - use this option to clear data from the existing library data table and download a single library

Append - use this option to add data to the existing library data table and when downloading multiple libraries during a single session

Download

Close

File Access Mode

Online Polar Library (ftp://polarinstruments.com)

On-Premise Mode [Application Note](#)

C:\Users\vicha\Desktop\Material_Library_2021

Browse...

Please Note: This data is accurate to the best of our knowledge, however it is provided, as is from our Material supplier partners. Please feedback any errors or inaccuracies to Polarcare and we will contact the material partner for clarification or rectification.

Embedded Microstrip structure enhancements

Improvements to the way the impedance structure substrate height (H parameter values) are calculated for Embedded Microstrip structures when the outer electrical layer is designated as Mixed

Layer	Material	Thickness (Mils/Thous)	Thickness (mm)
-	SM	Liquid PhotoImageable Mask	4.000/0.0195
1	Foil	Copper Foil	1.4000
-	PP	PrePreg 1080	4.200/0.0195
2	Core	FR4 Core	1.4000
3	Core	FR4 Core	3.0000
-	PP	PrePreg 3080	2.7760
-	PP	PrePreg 1651	5.5520
-	PP	PrePreg 1651	5.5520
4	Core	FR4 Core	1.4000
5	Core	FR4 Core	12.0000
-	PP	PrePreg 1651	5.5520
-	PP	PrePreg 1651	5.5520
-	PP	PrePreg 3080	2.7760
6	Core	FR4 Core	1.4000
7	Core	FR4 Core	3.0000
-	PP	PrePreg 1080	1.9500
8	Foil	Copper Foil	1.4000
-	SM	Liquid PhotoImageable Mask	4.000/0.0195

Parameter	Value
Substrate 1 Height	H1 3.0000
Substrate 1 Dielectric	Er1 4.2000
Substrate 2 Height	H2 3.3500
Substrate 2 Dielectric	Er2 4.2000
Lower Trace Width	W1 4.0182
Upper Trace Width	W2 3.0182
Trace Thickness	T1 1.4000
Impedance	Zo 49.88
Target Impedance	50.00
Target Tolerance %	10.00

New Confidential Stamp options added to the technical report

The screenshot shows the Speedstack Report Printer interface. The main window displays a technical report for a PCB stackup. At the top, the word "CONFIDENTIAL" is printed in large red letters. Below this is a table of the stackup layers, including details like Layer, Stack up, Supplier, Description, Type, Processed Thickness, ϵ_r , Loss Tangent, and Impedance ID. A diagram on the left shows the physical stackup with dimensions. Below the stackup table is a table of impedance structures with columns for Impedance ID, Structure Image, Structure Name, Impedance Signal Layer, Ref. Plane 1 in Layer, Ref. Plane 2 in Layer, Lower Trace Width (W1), Upper Trace Width (W2), Trace Separation (S1), Trace Pitch (S1+ W1), Target Impedance, and Calculated Impedance. A dialog box titled "Confidential Stamp Options" is open, showing a preview of the stamp with the word "CONFIDENTIAL" and a red line through it. The dialog has an "Alternative word" field and four checkboxes for "Location 1", "Location 2", "Location 3", and "Location 4". A blue callout box points to the dialog with the text: "The confidential stamps are customisable in terms of the text used and location. This new functionality is available from the technical report Options menu".

Layer	Stack up	Supplier	Description	Type	Processed Thickness	ϵ_r	Loss Tangent	Impedance ID
1		Polar Samples	Liquid PhotoImageable Mask	SolderMask	1.000	4.000	0.0195	
		Polar Samples	Copper Foil	Copper	1.400			1, 2
		Polar Samples	PrePreg 1050	Dielectric	1.950	4.200	0.0195	
2		Polar Samples	FR4 Core	FR4	1.400			
		Polar Samples	PrePreg 3080	Dielectric	2.775	4.200	0.0195	
		Polar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
		Polar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
3		Polar Samples	FR4 Core	FR4	12.000	4.200	0.0195	3
		Polar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
		Polar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
		Polar Samples	PrePreg 3080	Dielectric	2.775	4.200	0.0195	
4		Polar Samples	FR4 Core	FR4	3.000	4.200	0.0195	
		Polar Samples	PrePreg 1050	Dielectric	1.950	4.200	0.0195	
5		Polar Samples	Copper Foil	Copper	1.400			4
		Polar Samples	Liquid PhotoImageable Mask	SolderMask	1.000	4.000	0.0195	

Impedance ID	Structure Image	Structure Name	Impedance Signal Layer	Ref. Plane 1 in Layer	Ref. Plane 2 in Layer	Lower Trace Width (W1)	Upper Trace Width (W2)	Trace Separation (S1)	Trace Pitch (S1+ W1)	Target Impedance	Calculated Impedance
1		Edge Coupled Coated Microstrip 1B	1	3	0	7.650	6.650	8.115	15.765	100.000	100.290
2		Coated Microstrip 1B	1	3	0	4.000	3.000	0.000	0.000	75.000	75.740
3		Edge Coupled Offset Stripline 1B1A									
4		Coated Microstrip 1B									

Speedstack v22.01.01 (January 2022)

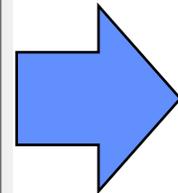
Snap Parameters and Calculate Structure

Stack Up Editor | DRC : 0 | Controlled Impedance | CI Results

Edge Coupled Coated Microstrip 1B

Substrate 1 Height	H1	6.3500
Substrate 1 Dielectric	Er1	4.2000
Lower Trace Width	W1	7.6500
Upper Trace Width	W2	6.6500
Trace Separation	S1	8.1150
Trace Thickness	T1	1.4000
Coating Above Substrate	C1	1.0000
Coating Above Trace	C2	1.0000
Coating Between Traces	C3	1.0000
Coating Dielectric	CEr	4.0000
Differential Impedance	Zd	100.29
Target Impedance		100.00
Target Tolerance %		10.00

Original parameter values



Stack Up Editor | DRC : 0 | Controlled Impedance | CI Results

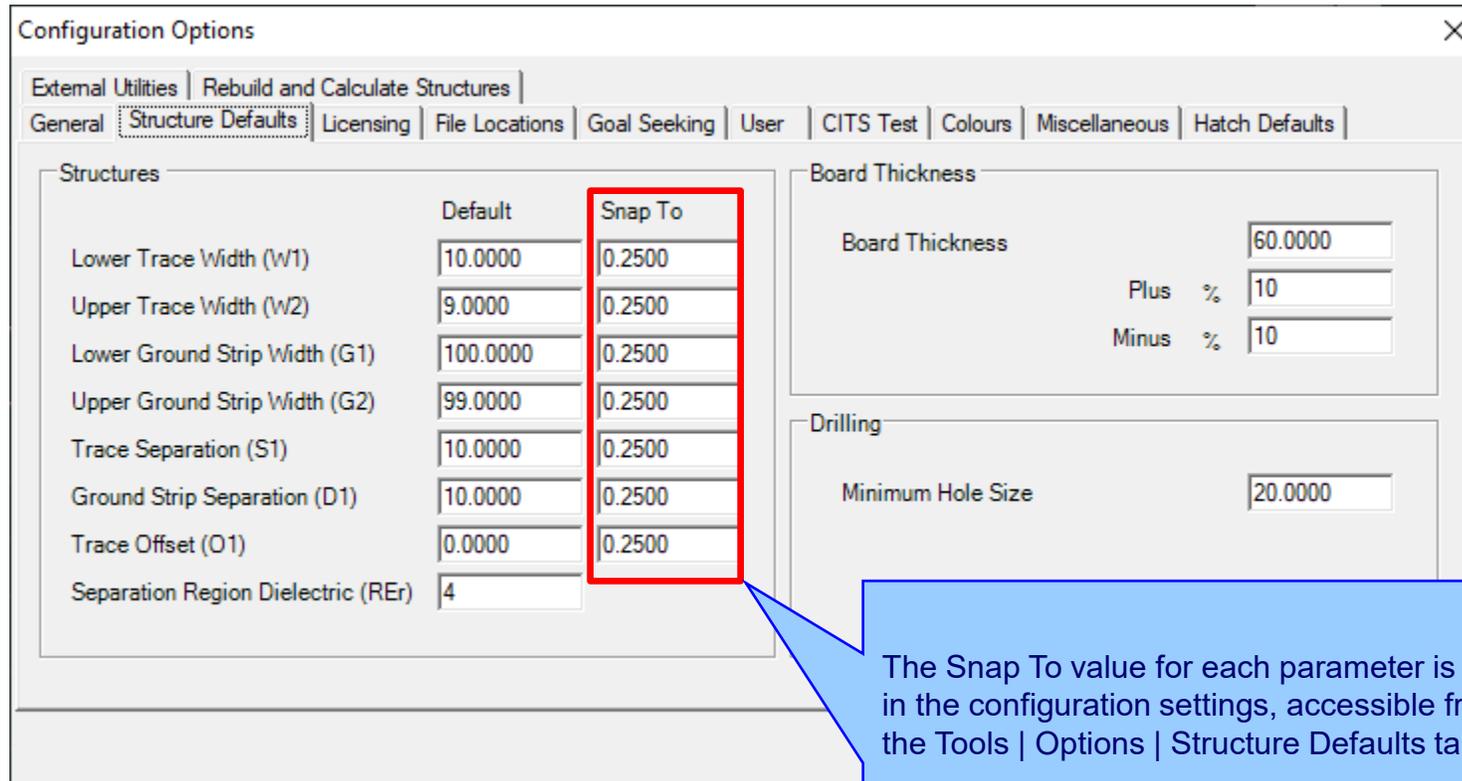
Edge Coupled Coated Microstrip 1B

Substrate 1 Height	H1	6.3500
Substrate 1 Dielectric	Er1	4.2000
Lower Trace Width	W1	7.7500
Upper Trace Width	W2	6.7500
Trace Separation	S1	8.0000
Trace Thickness	T1	1.4000
Coating Above Substrate	C1	1.0000
Coating Above Trace	C2	1.0000
Coating Between Traces	C3	1.0000
Coating Dielectric	CEr	4.0000
Differential Impedance	Zd	99.49
Target Impedance		100.00
Target Tolerance %		10.00

Snapped/rounded parameter values

- Snap Parameters and Calculate Structure
1. Snap / round parameters to practical values that are more appropriate for fabrication
 2. The Snap feature supports the following structure parameters : Lower Trace Width (W1), Upper Trace Width (W2), Lower Ground Strip Width (G1), Upper Ground Strip Width (G2), Trace Separation (S1), Ground Strip Separation (D1), Trace Offset (O1)
 3. The Snap To value for each parameter is held in the configuration settings, in this example 0.25 mils.

Snap Parameters and Calculate Structure



Structures	Default	Snap To
Lower Trace Width (W1)	10.0000	0.2500
Upper Trace Width (W2)	9.0000	0.2500
Lower Ground Strip Width (G1)	100.0000	0.2500
Upper Ground Strip Width (G2)	99.0000	0.2500
Trace Separation (S1)	10.0000	0.2500
Ground Strip Separation (D1)	10.0000	0.2500
Trace Offset (O1)	0.0000	0.2500
Separation Region Dielectric (REr)	4	

Board Thickness

Board Thickness: 60.0000

Plus %: 10

Minus %: 10

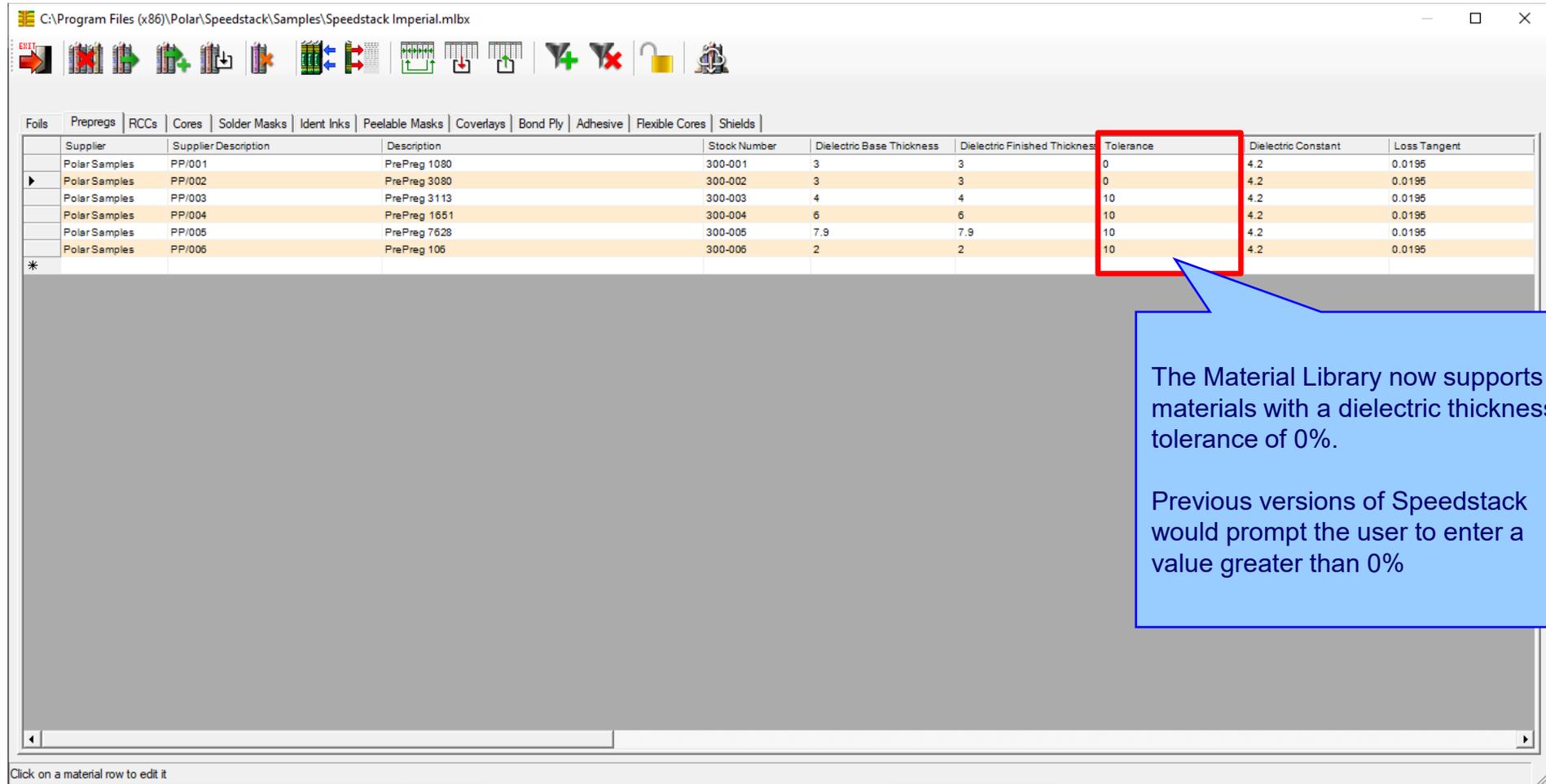
Drilling

Minimum Hole Size: 20.0000

The Snap To value for each parameter is held in the configuration settings, accessible from the Tools | Options | Structure Defaults tab.

Although all Snap To values shown here are set to 0.25 mils, each parameter can support a different value

Material Library Enhancements



The screenshot shows the Speedstack Material Library interface. The window title is "C:\Program Files (x86)\Polar\Speedstack\Samples\Speedstack Imperial.mlbx". The interface includes a toolbar with various icons and a tabbed menu with categories: Foils, Prepregs, RCCs, Cores, Solder Masks, Ident Inks, Peelable Masks, Coverlays, Bond Ply, Adhesive, Flexible Cores, and Shields. The main area displays a table of materials with the following columns: Supplier, Supplier Description, Description, Stock Number, Dielectric Base Thickness, Dielectric Finished Thickness, Tolerance, Dielectric Constant, and Loss Tangent. A red box highlights the 'Tolerance' column, and a blue callout box points to it with the following text:

The Material Library now supports materials with a dielectric thickness tolerance of 0%.

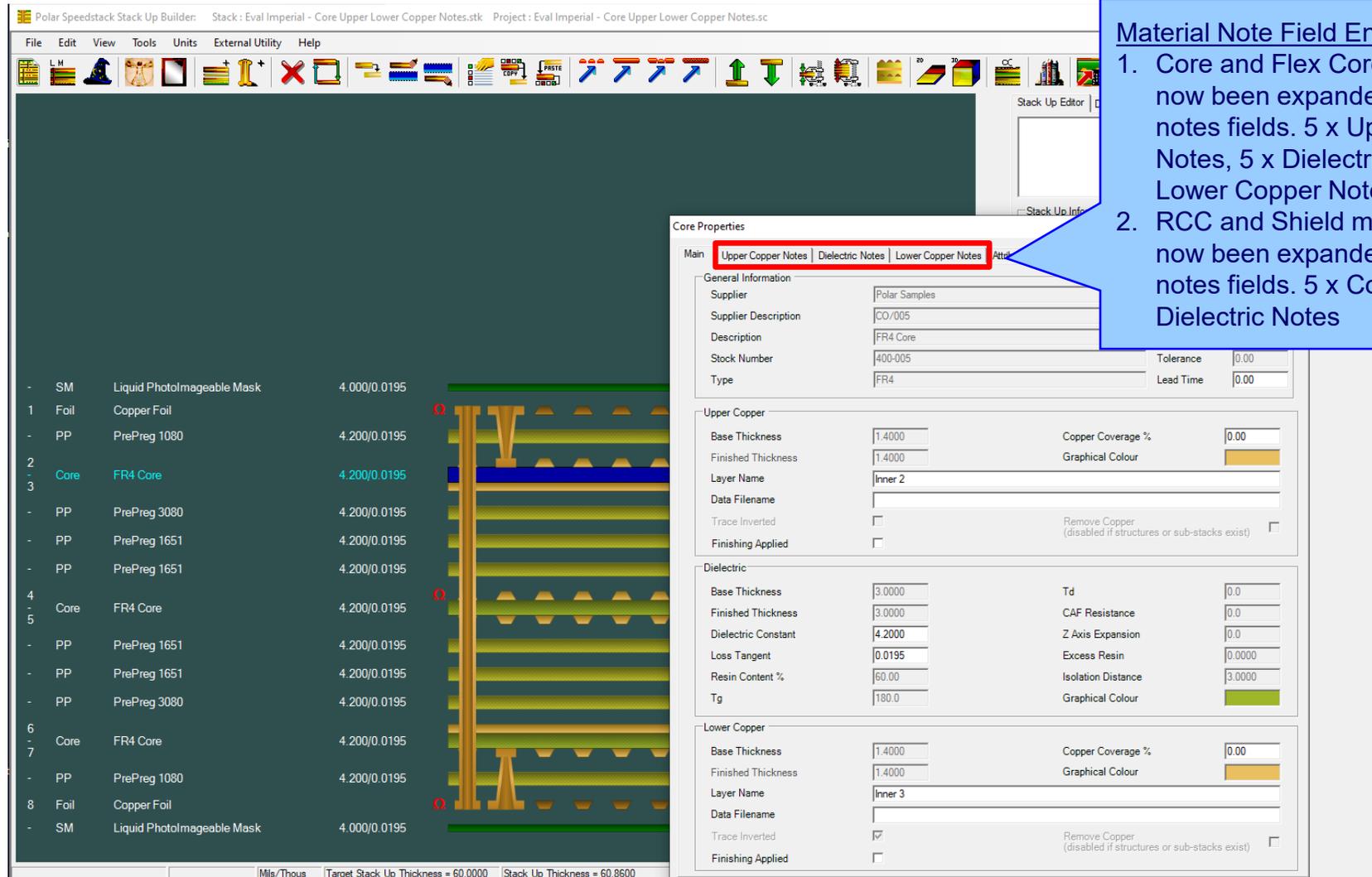
Previous versions of Speedstack would prompt the user to enter a value greater than 0%

Supplier	Supplier Description	Description	Stock Number	Dielectric Base Thickness	Dielectric Finished Thickness	Tolerance	Dielectric Constant	Loss Tangent
Polar Samples	PP/001	PrePreg 1080	300-001	3	3	0	4.2	0.0195
Polar Samples	PP/002	PrePreg 3080	300-002	3	3	0	4.2	0.0195
Polar Samples	PP/003	PrePreg 3113	300-003	4	4	10	4.2	0.0195
Polar Samples	PP/004	PrePreg 1651	300-004	6	6	10	4.2	0.0195
Polar Samples	PP/005	PrePreg 7628	300-005	7.9	7.9	10	4.2	0.0195
Polar Samples	PP/006	PrePreg 106	300-006	2	2	10	4.2	0.0195

*
Click on a material row to edit it

Speedstack v21.11.01 (November 2021)

Material Note Field Enhancements – improvements to stack up documentation

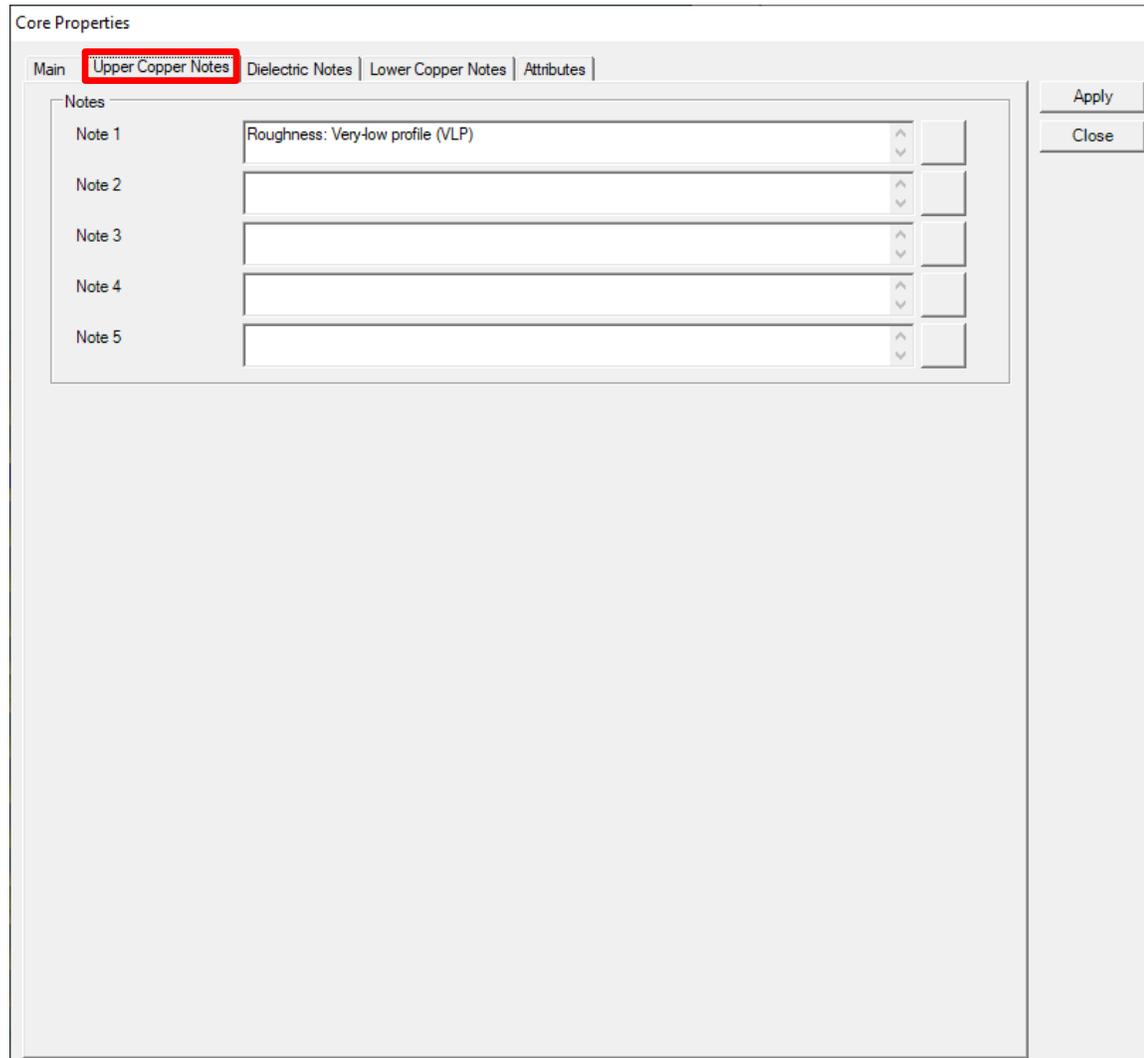


Material Note Field Enhancements

1. Core and Flex Core materials have now been expanded to support 15 notes fields. 5 x Upper Copper Notes, 5 x Dielectric Notes, 5 x Lower Copper Notes
2. RCC and Shield materials have now been expanded to support 10 notes fields. 5 x Copper Notes, 5 x Dielectric Notes

Layer	Material	Thickness	
-	SM	Liquid Photolmageable Mask	4.000/0.0195
1	Foil	Copper Foil	
-	PP	PrePreg 1080	4.200/0.0195
2	Core	FR4 Core	4.200/0.0195
3			
-	PP	PrePreg 3080	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
4			
5	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
-	PP	PrePreg 3080	4.200/0.0195
6			
7	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
8	Foil	Copper Foil	
-	SM	Liquid Photolmageable Mask	4.000/0.0195

Material Note Field Enhancements – improvements to stack up documentation



Core Properties

Main | **Upper Copper Notes** | Dielectric Notes | Lower Copper Notes | Attributes

Notes

Note 1	Roughness: Very-low profile (VLP)	^	v
Note 2		^	v
Note 3		^	v
Note 4		^	v
Note 5		^	v

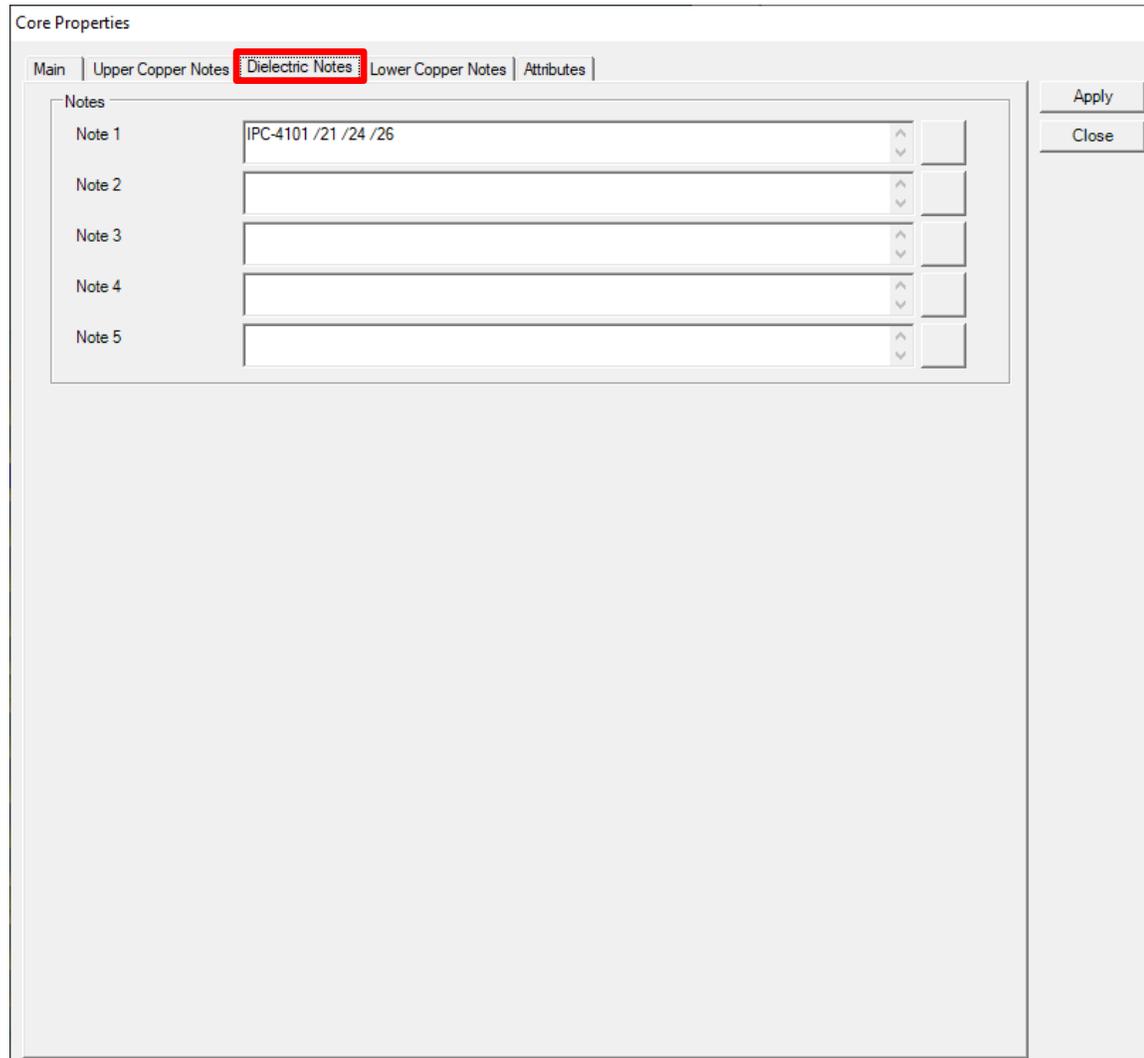
Apply

Close

The new Upper and Lower Copper Notes allow the user to specify important information about the copper surfaces for a Core and Flex Core material.

For instance, copper roughness and plating fabrication information can be specified

Material Note Field Enhancements – improvements to stack up documentation



Core Properties

Main | Upper Copper Notes | **Dielectric Notes** | Lower Copper Notes | Attributes

Notes

Note 1	IPC-4101 /21 /24 /26	^	v
Note 2		^	v
Note 3		^	v
Note 4		^	v
Note 5		^	v

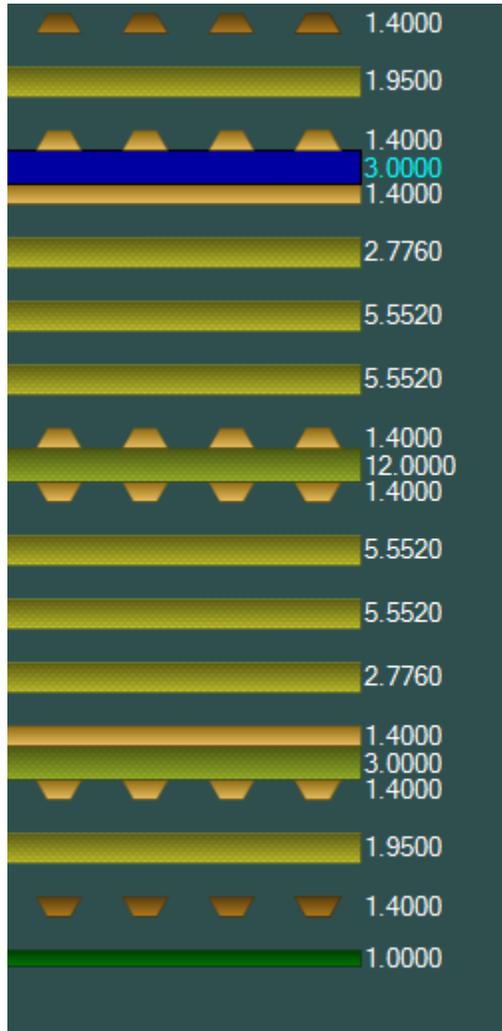
Apply

Close

Dielectric Notes are useful for specifying IPC-4101 slash sheet categories, glass weave information (spread glass) and other important information regarding the dielectric region of the core.

The existing five Notes fields from previous versions of Speedstack will be allocated as Dielectric Notes.

Material Note Field Enhancements – improvements to stack up documentation



Selected Item Information : Core

Field	Value
Upper Copper Notes	
Note 1	Roughness: Very-low profile
Note 2	
Note 3	
Note 4	
Note 5	
Dielectric Notes	
Note 1	IPC-4101 /21 /24 /26
Note 2	
Note 3	
Note 4	
Note 5	
Lower Copper Notes	
Note 1	Roughness: Very-low profile
Note 2	
Note 3	
Note 4	
Note 5	
Cost	5
Lead Time	0
Attributes	

When selecting a core / flex core material the Upper Copper, Dielectric and Lower Copper Notes can be confirmed here.

ess with Soldermask = 62.8600 | V21.11.01

Material Note Field Enhancements – library enhancements

Review/Edit Cores

Supplier	Polar Samples
Supplier Description	CO/005
Description	FR4 Core
Stock Number	400-005
Type	FR4
Base Thickness	3.0000
Finished Thickness	3.0000
Dielectric Constant	4.2
Loss Tangent	0.0195
Resin Content	60
Tg	180
Td	0
CAF Resistance	0
Z Axis Expansion	0
Tolerance +/-%	10
Upper Cu Thickness	1.4000
Lower Cu Thickness	1.4000
Cost	5
Lead Time	0
Size	*
Use in Auto Stack	<input checked="" type="checkbox"/>
Planes Both Sides	<input type="checkbox"/>
Laser Drillable	<input checked="" type="checkbox"/>

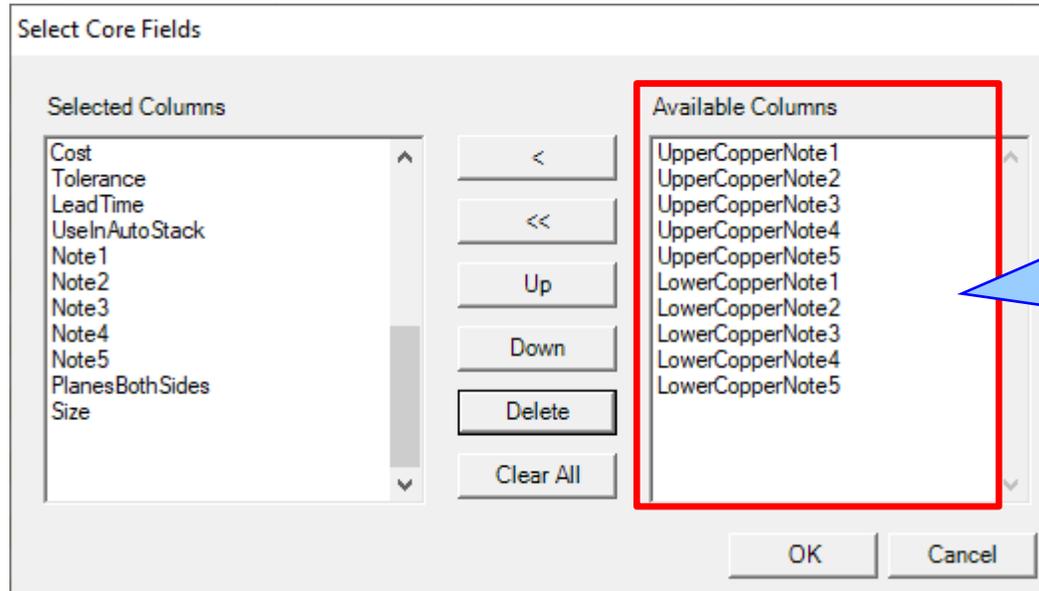
Upper Copper Notes		Dielectric Notes		Lower Copper Notes	
Note 1	Roughness: Very-low profile (VLP)	Note 1	IPC-4101 /21 /24 /26	Note 1	Roughness: Very-low profile (VLP)
Note 2		Note 2		Note 2	
Note 3		Note 3		Note 3	
Note 4		Note 4		Note 4	
Note 5		Note 5		Note 5	

<< < 5 of 27 > >>

The Speedstack material library has been enhanced to support the extra notes fields.

Notes added to the materials in the library will automatically be transferred to the stack up.

Material Note Field Enhancements – library enhancements



For existing Speedstack users upgrading to v21.11, use the Select and Arrange Columns and Save Column Order toolbar options to add these new material library columns to the Data Grid view



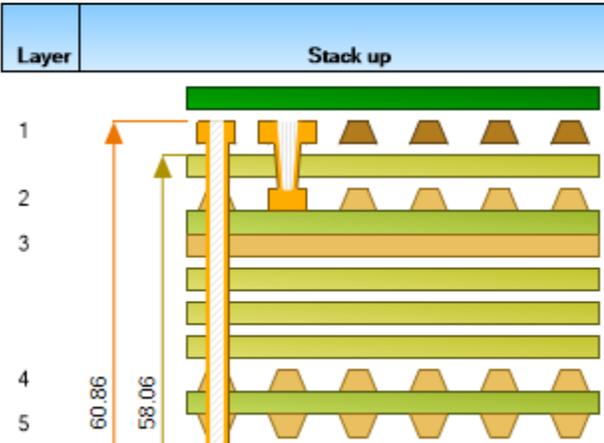
Material Library Import / Export

The import / export options have been enhanced to support the additional material library notes columns.



Material Note Field Enhancements – technical report enhancements

C:\Apps\Samples\Eval Imperial - Core Upper Lower Copper Notes.sci Units: Mils

Layer	Stack up	Manufacturing Notes	Copper Layer Name	Supplier	Description
1				Polar Samples	Liquid Photolmageable Mask
			Top	Polar Samples	Copper Foil
2		Roughness: Very-low profile (VLP) IPC-4101 /21 /24 /26	Inner 2	Polar Samples	PrePreg 1080
3		Roughness: Very-low profile (VLP)	Inner 3	Polar Samples	FR4 Core
				Polar Samples	PrePreg 3080
4				Polar Samples	PrePreg 1651
5				Supplier	PrePreg 1651

The technical report has been updated to support the additional notes fields. Notice the Upper Copper, Dielectric and Lower Copper Notes align with the appropriate part of the Core material.

Import / Export enhancements

The following Import / Export options have been updated to support the additional material notes properties introduced with Speedstack v21.11.01:

- XML STKX v23.00 and SSX v13.00 import / export options
- CSV export option

Speedstack v21.07.08 (July 2021)

New Drill Cap feature

The screenshot shows the Polar Speedstack Stack Up Builder interface. The main window displays a stack up configuration with 13 layers. A red box highlights a specific layer configuration for a drill cap. The right-hand panel shows a cross-sectional diagram of a 'Coated Microstrip 18' with various parameters defined in a table below it.

Parameter	Value
Substrate 1 Height	H1 13.2250
Substrate 1 Dielectric	Er1 4.2000
Lower Trace Width	W1 10.1563
Upper Trace Width	W2 9.1563
Trace Thickness	T1 1.4000
Coating Above Substrate	C1 1.0000
Coating Above Trace	C2 1.0000

The new Drill Cap feature has been introduced to clearly document when via holes are capped, the process where a conductive 'lid' is added to the via hole during fabrication.

Buried vias, plated holes that start and end on inner layers of a stack up, are often capped.

Drill Cap option – mechanical through plated drills

Drill Properties

Main | Notes

Electrical Layers

Stack Up Column	First Electrical Layer No (Start Layer)	Second Electrical Layer No (End Layer)	Back Drill Must-Cut Layer No	Back Drill Must-Not-Cut Layer No
2	4	9		

Drill Information

Mechanical Laser Back Drill

Fill Type: Copper Paste

Through Plated

First Layer Capped
 Second Layer Capped

Data Filenames: []

Back Drill Information

Minimum Distance From Must-Cut Layer	Minimum Distance From Must-Not-Cut Layer
0.0000	0.0000
Maximum Distance From Must-Cut Layer	Maximum Distance From Must-Not-Cut Layer
0.0000	0.0000
Primary Drill Size	
0.0000	

Hole Information

Hole Count	Minimum Drill Size
0	0.0000
Different Hole Sizes	Minimum Drill Size Tolerance (Abs)
0	0.0000
Minimum Hole Size	Minimum Barrel Wall Thickness
0.0000	0.0000
Minimum Pad Size	
0.0000	

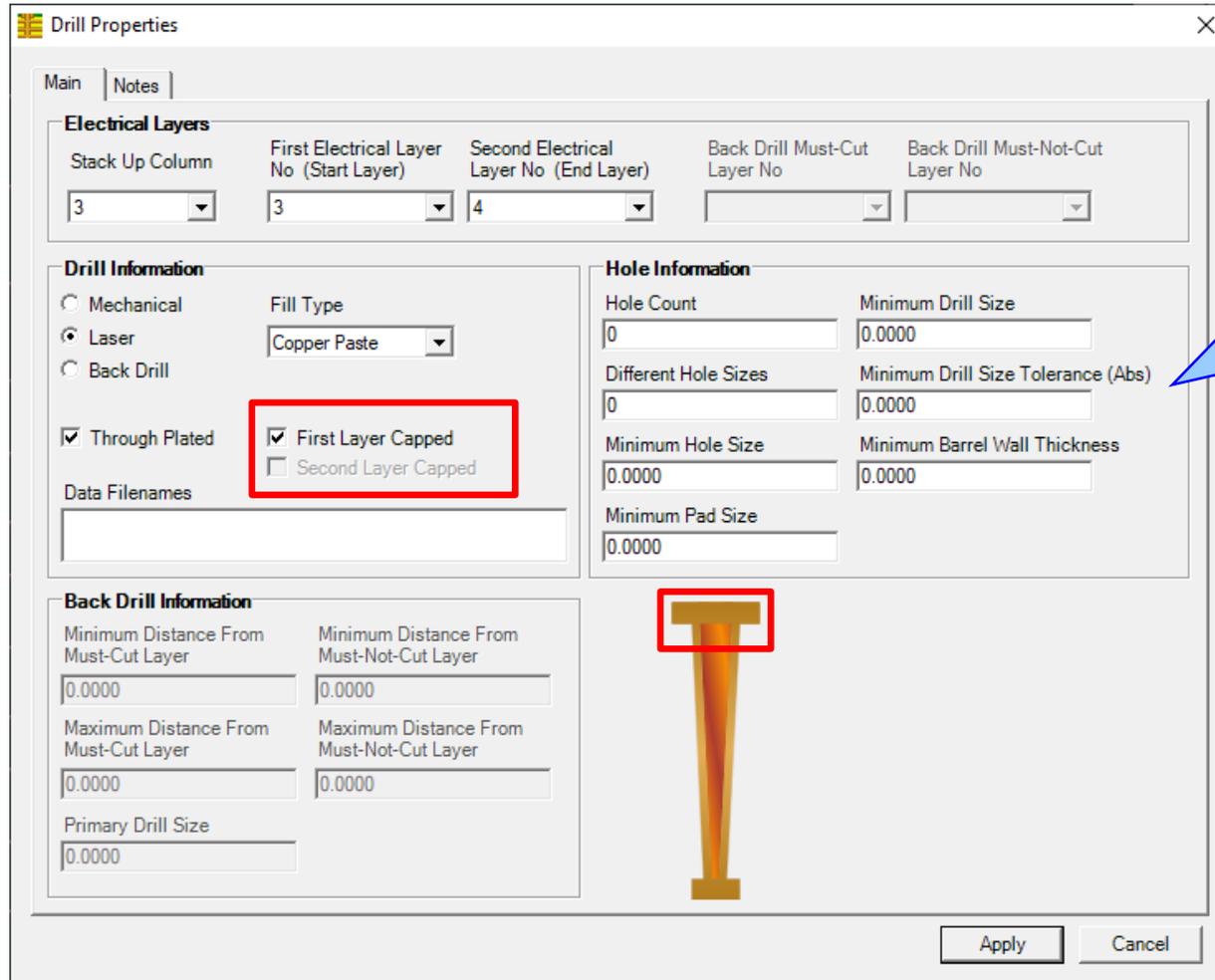
Apply Cancel

Mechanical

For mechanical drills it is possible to have four states:

1. Neither first or second layer capped (default when adding a drill)
2. First layer capped
3. Second layer capped
4. Both layers capped

Drill Cap option – laser drills



Drill Properties

Main | Notes

Electrical Layers

Stack Up Column	First Electrical Layer No (Start Layer)	Second Electrical Layer No (End Layer)	Back Drill Must-Cut Layer No	Back Drill Must-Not-Cut Layer No
3	3	4		

Drill Information

Mechanical Laser Back Drill

Fill Type: Copper Paste

Through Plated

First Layer Capped
 Second Layer Capped

Data Filenames

Back Drill Information

Minimum Distance From Must-Cut Layer	Minimum Distance From Must-Not-Cut Layer
0.0000	0.0000
Maximum Distance From Must-Cut Layer	Maximum Distance From Must-Not-Cut Layer
0.0000	0.0000
Primary Drill Size	
0.0000	

Hole Information

Hole Count	Minimum Drill Size
0	0.0000
Different Hole Sizes	Minimum Drill Size Tolerance (Abs)
0	0.0000
Minimum Hole Size	Minimum Barrel Wall Thickness
0.0000	0.0000
Minimum Pad Size	
0.0000	

Apply Cancel

Laser

For laser drills it is possible to have two states as the Second Layer Capped checkbox is disabled:

1. Not capped (default when adding a drill)
2. First layer capped

New Drill Cap feature

Stack Up Editor | DRC : 0 | Controlled Impedance | CI Results

Field	Value
Electrical Layer Count	12
Stack Up Cost	46.00
Copper Thickness	19.6000
Dielectric Thickness	37.3600
Solder Mask Thickness	2.0000
-----	-----
Target Stack Up Thickness	60.0000
Stack Up Thickness	56.9600
Stack Up Thickness with Soldermask	58.9600
-----	-----

Field	Value
First Electrical Layer No	4
Second Electrical Layer No	9
Mechanical Drill	True
Laser Drill	False
Back Drill	False
Through Plated	True
First Layer Capped	True
Second Layer Capped	True
Fill Type	Copper Paste
Data Filenames	
Hole Count	
Different Hole Sizes	0
Minimum Hole Size	0
Minimum Allowable Hole S	
Minimum Pad Size	
Minimum Drill Size	
Minimum Drill Size Toler	
Minimum Barrel Wall Thic	
Note 1	
Note 2	
Note 3	
Note 4	
Note 5	

Mils/Thous | Target Stack Up Thickness = 60.0000 | Stack Up Thickness = 56.9600 | Stack Up Thickness with Soldermask = 58.9600 | Beta V21.07.08

Import / Export enhancements

The following Import / Export options have been updated to support the drill cap properties introduced with Speedstack v21.07.08:

- XML STKX v22.00 and SSX v12.00 import / export options
- CSV export option

Speedstack v21.05.06 (May 2021)

New Layer Name property for electrical / copper layers

The screenshot shows the Polar Speedstack Stack Up Builder interface. On the left, a table lists the layers of a PCB stack-up. A 3D model of the stack-up is shown in the center, with a red box highlighting the electrical and copper layers. On the right, a detailed cross-section diagram of an edge-coupled microstrip is shown, along with a table of its parameters.

Layer	Material	Thickness	
-	SM	Liquid Photoimageable Mask	4.000/0.0195
1	Foil	Copper Foil	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
2	Core	FR4 Core	4.200/0.0195
3			
-	PP	PrePreg 3080	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
4	Core	FR4 Core	4.200/0.0195
5			
-	PP	PrePreg 1651	4.200/0.0195
-	PP	PrePreg 1651	4.200/0.0195
-	PP	PrePreg 3080	4.200/0.0195
6	Core	FR4 Core	4.200/0.0195
7			
-	PP	PrePreg 1080	4.200/0.0195
8	Foil	Copper Foil	4.200/0.0195
-	SM	Liquid Photoimageable Mask	4.000/0.0195

Parameter	Value
Substrate 1 Height	H1 [6.3500]
Substrate 1 Dielectric	Er1 [4.2000]
Lower Trace Width	W1 [7.6500]
Upper Trace Width	W2 [6.6500]
Trace Separation	S1 [8.1150]
Trace Thickness	T1 [1.4000]
Coating Above Substrate	C1 [1.0000]

A new Layer Name property has been introduced to the electrical / copper layer element of Foils, Cores, Flex Cores, RCCs and Shields

Speedstack will continue to use the automatic layer numbers but this new text field allows users to key in their own descriptions to match existing layer naming conventions

New Layer Name property for electrical / copper layers

Foil Properties

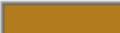
Main | Notes | Attributes

Apply

General Information

Supplier	Polar Samples	Cost	1.00
Supplier Description	FO/001	Lead Time	0.00
Description	Copper Foil		
Stock Number	100-001		
Type	Copper		

Copper

Base Thickness	0.7000	Copper Coverage %	0.00
Finished Thickness	1.4000	Graphical Colour	
Layer Name	Top		
Data Filename			
Trace Inverted	<input type="checkbox"/>	Remove Copper (disabled if structures or sub-stacks exist)	<input type="checkbox"/>
Finishing Applied	<input type="checkbox"/>		

Foil Properties

The new Layer Name property exists on all materials with an electrical / copper layer. The user can key in any alphanumeric name

New Layer Name property for electrical / copper layers

Core Properties

Main | Notes | Attributes

General Information

Supplier	Polar Samples	Exchange Copper	<input type="checkbox"/>
Supplier Description	CO/005		
Description	FR4 Core	Cost	5.00
Stock Number	400-005	Tolerance	0.00
Type	FR4	Lead Time	0.00

Upper Copper

Base Thickness	1.4000	Copper Coverage %	0.00
Finished Thickness	1.4000	Graphical Colour	
Layer Name	Inner 2		
Data Filename			
Trace Inverted	<input type="checkbox"/>	Remove Copper (disabled if structures or sub-stacks exist)	<input type="checkbox"/>
Finishing Applied	<input type="checkbox"/>		

Dielectric

Base Thickness	3.0000	Td	0.0
Finished Thickness	3.0000	CAF Resistance	0.0
Dielectric Constant	4.2000	Z Axis Expansion	0.0
Loss Tangent	0.0195	Excess Resin	0.0000
Resin Content %	60.00	Isolation Distance	3.0000
Tg	180.0	Graphical Colour	

Lower Copper

Base Thickness	1.4000	Copper Coverage %	0.00
Finished Thickness	1.4000	Graphical Colour	
Layer Name	Inner 3		
Data Filename			
Trace Inverted	<input checked="" type="checkbox"/>	Remove Copper (disabled if structures or sub-stacks exist)	<input type="checkbox"/>
Finishing Applied	<input type="checkbox"/>		

Apply

Close

Core Properties

For core materials, a new Layer Name property has been added for both upper and lower electrical / copper layers

New Layer Name property for electrical / copper layers

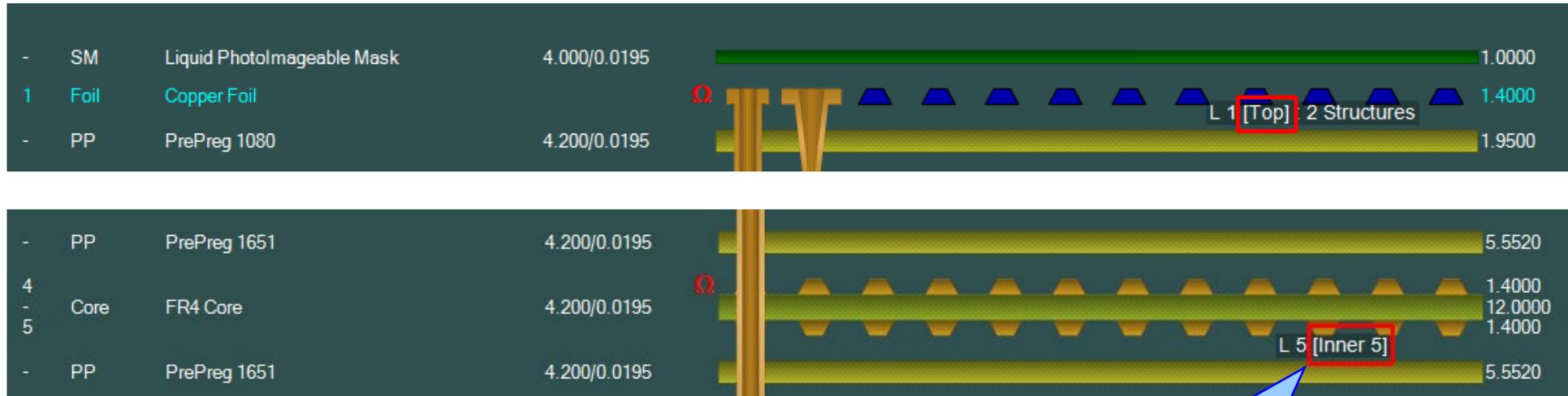
The screenshot shows the Polar Speedstack Stack Up Builder interface. The main window displays a stack up editor with a table of materials and a 3D visualization of the stack. The table lists materials such as Liquid Photolmageable Mask, Copper Foil, PrePreg 1080, FR4 Core, and PrePreg 1651. The right-hand panel shows 'Stack Up Information' and 'Selected Item Information'. The 'Selected Item Information' panel is currently displaying properties for a 'Foil' layer, and the 'Layer Name' field is highlighted with a red box and set to 'Top'.

Field	Value
Electrical Layer Count	8
Stack Up Cost	54.00
Copper Thickness	11.2000
Dielectric Thickness	49.6600
Solder Mask Thickness	2.0000
Target Stack Up Thickness	60.0000
Stack Up Thickness	60.8600
Stack Up Thickness with Soldermask	62.8600

Field	Value
Supplier	Polar Samples
Supplier Description	FO.001
Description	Copper Foil
Stock Number	100-001
Type	Copper
Cu Base Thickness	0.7000
Cu Finished Thickness	1.4000
Copper Coverage	0
Layer Name	Top
Data Filenames	
Minimum Trace Width	2.9528

The Selected Item Information auto updates as you click each material, the Layer Name can be confirmed here

New Layer Name property for electrical / copper layers



Mouse over the electrical layer and the Layer Name will display alongside the layer number and the amount of structures. Very quickly confirm the Layer Name without needing to open the Properties dialog

New Layer Name property for electrical / copper layers

The screenshot displays the Speedstack software interface. On the left, a table lists the stack up layers:

-	SM	Liquid PhotoImageable Mask	4.000/0.0195
1	Fail	Copper Fail	
-	PP	PrePreg 1080	4.200/0.0195
2	Core	FR4 Core	4.200/0.0195
3			
-	PP	PrePreg 30	
-	PP	PrePreg 16	
-	PP	PrePreg 16	
4			

In the center, a stack up graphic shows various layers with a red box highlighting the labels: Top, Inner 2, Inner 3, Inner 4, Inner 5, Inner 6, Inner 7, and Bottom.

A blue callout box points to the stack up graphic with the text: "Customise the Display Fields to show the layer name next to the stack up graphic".

The "Configuration Options" dialog box is open, showing the "Display Data" tab. The "Display Fields 1 and 2 are reserved for Layer Numbers and Layer Types" section is visible. The "Display Field 5" dropdown menu is open, showing a list of properties, with "Layer Name" selected and highlighted by a red box.

New Layer Name property for electrical / copper layers

Speedstack Report Printer

File Options

C:\Mpsst\Samples\Eval Imperial.sci Units: Mils

Layer	Stack up	Copper Layer Name	Supplier	Description	Type	Processed Thickness	εr	Loss Tangent	Impedance ID
1	Top		Polar Samples	Liquid PhotoImageable Mask	SolderMask	1.000	4.000	0.0195	
			Polar Samples	Copper Foil	Copper	1.400			1, 2
2	Inner 2		Polar Samples	PrePreg 1080	Dielectric	1.950	4.200	0.0195	
3	Inner 3		Polar Samples	FR4 Core	FR4	3.000	4.200	0.0195	
			Polar Samples	PrePreg 3080	Dielectric	1.400			
			Polar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
			Polar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
4	Inner 4					1.400			3
			Polar Samples	FR4 Core	FR4	12.000	4.200	0.0195	
						1.400			
			Polar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
			Polar Samples	PrePreg 1651	Dielectric	5.552	4.200	0.0195	
			Polar Samples	PrePreg 3080	Dielectric	2.776	4.200	0.0195	
6	Inner 6					1.400			
			Polar Samples	FR4 Core	FR4	3.000	4.200	0.0195	
7	Inner 7					1.400			
			Polar Samples	PrePreg 1080	Dielectric	1.950	4.200	0.0195	
8	Bottom		Polar Samples	Copper Foil	Copper	1.400			4
			Polar Samples	Liquid PhotoImageable Mask	SolderMask	1.000	4.000	0.0195	

Copper Thickness = 11.200 | Dielectric Thickness = 49.660 | Solder Mask Thickness = 2.000 | Stack Up Thickness = 60.860 | Stack Up Thickness with Soldermask = 62.860
Stack Up Cost = 54.00

Impedance ID	Structure Image	Structure Name	Impedance Signal Layer	Ref. Plane 1 in Layer	Ref. Plane 2 in Layer	Lower Trace Width (W1)	Upper Trace Width (W2)	Trace Separation (S1)	Target Impedance	Calculated Impedance
1		Edge Coupled Coated Microstrip 1B	1	3	0	7.650	6.650	8.115	100.000	100.290
2		Coated Microstrip 1B	1	3	0	4.000	3.000	0.000	75.000	75.740
3		Edge Coupled Offset Stripline 1B1A	4	3	6	7.250	6.250	8.500	100.000	101.280
4		Coated Microstrip 1B	8	6	0	4.000	3.000	0.000	75.000	75.740

StackName: Master
Date: _____
Author: _____
Department: _____
Site: _____

Version: _____
Associated Documents: _____

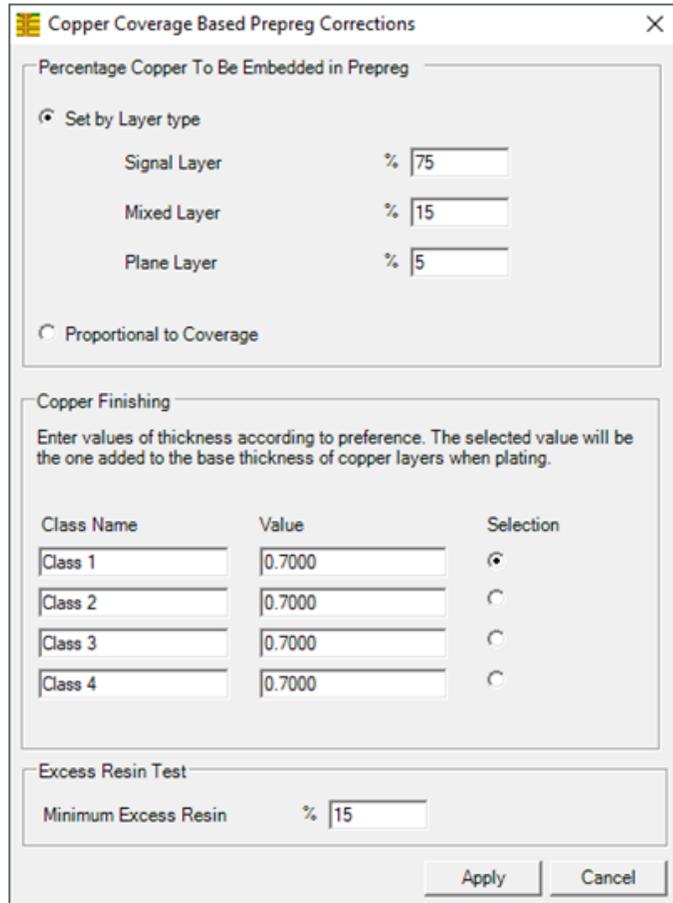
Revision: _____
Modification: _____
Date of Revision: _____
Editor: _____

Page 1/X

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The technical report has also been updated to support layer names

Copper Finishing classes increased



Copper Coverage Based Prepreg Corrections

Percentage Copper To Be Embedded in Prepreg

Set by Layer type

Signal Layer % 75

Mixed Layer % 15

Plane Layer % 5

Proportional to Coverage

Copper Finishing

Enter values of thickness according to preference. The selected value will be the one added to the base thickness of copper layers when plating.

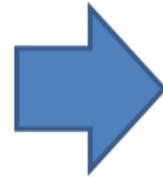
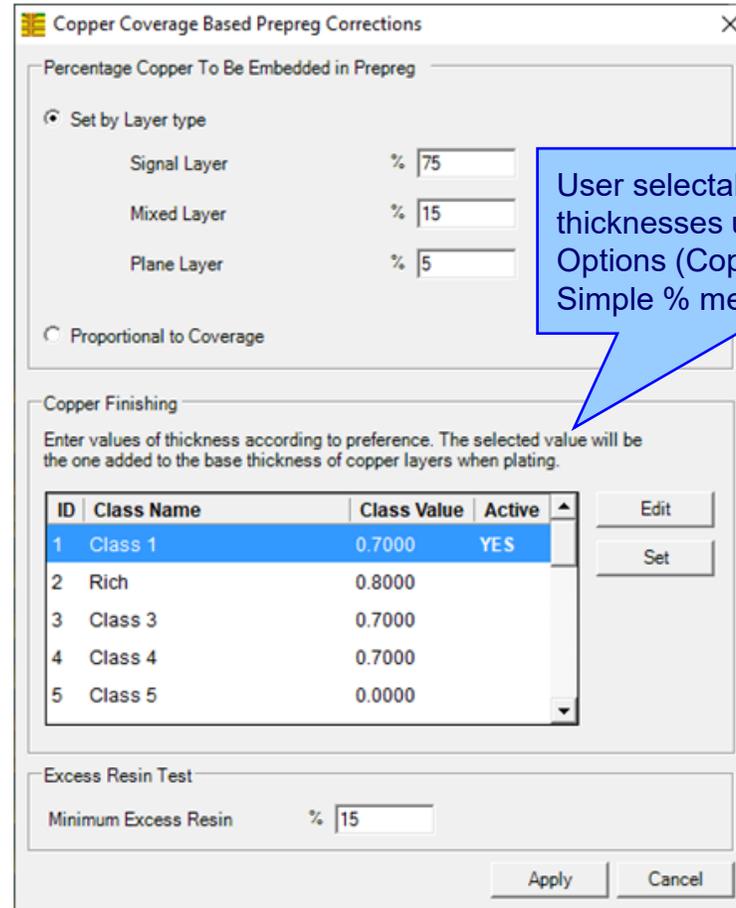
Class Name	Value	Selection
Class 1	0.7000	<input checked="" type="radio"/>
Class 2	0.7000	<input type="radio"/>
Class 3	0.7000	<input type="radio"/>
Class 4	0.7000	<input type="radio"/>

Excess Resin Test

Minimum Excess Resin % 15

Apply Cancel

Speedstack v21.04 and earlier supported 4 classes

Copper Coverage Based Prepreg Corrections

Percentage Copper To Be Embedded in Prepreg

Set by Layer type

Signal Layer % 75

Mixed Layer % 15

Plane Layer % 5

Proportional to Coverage

Copper Finishing

Enter values of thickness according to preference. The selected value will be the one added to the base thickness of copper layers when plating.

ID	Class Name	Class Value	Active
1	Class 1	0.7000	YES
2	Rich	0.8000	
3	Class 3	0.7000	
4	Class 4	0.7000	
5	Class 5	0.0000	

Excess Resin Test

Minimum Excess Resin % 15

Apply Cancel

User selectable plating thicknesses under Finishing Options (Copper Coverage & Simple % methods)

Speedstack v21.05 now supports 20 classes

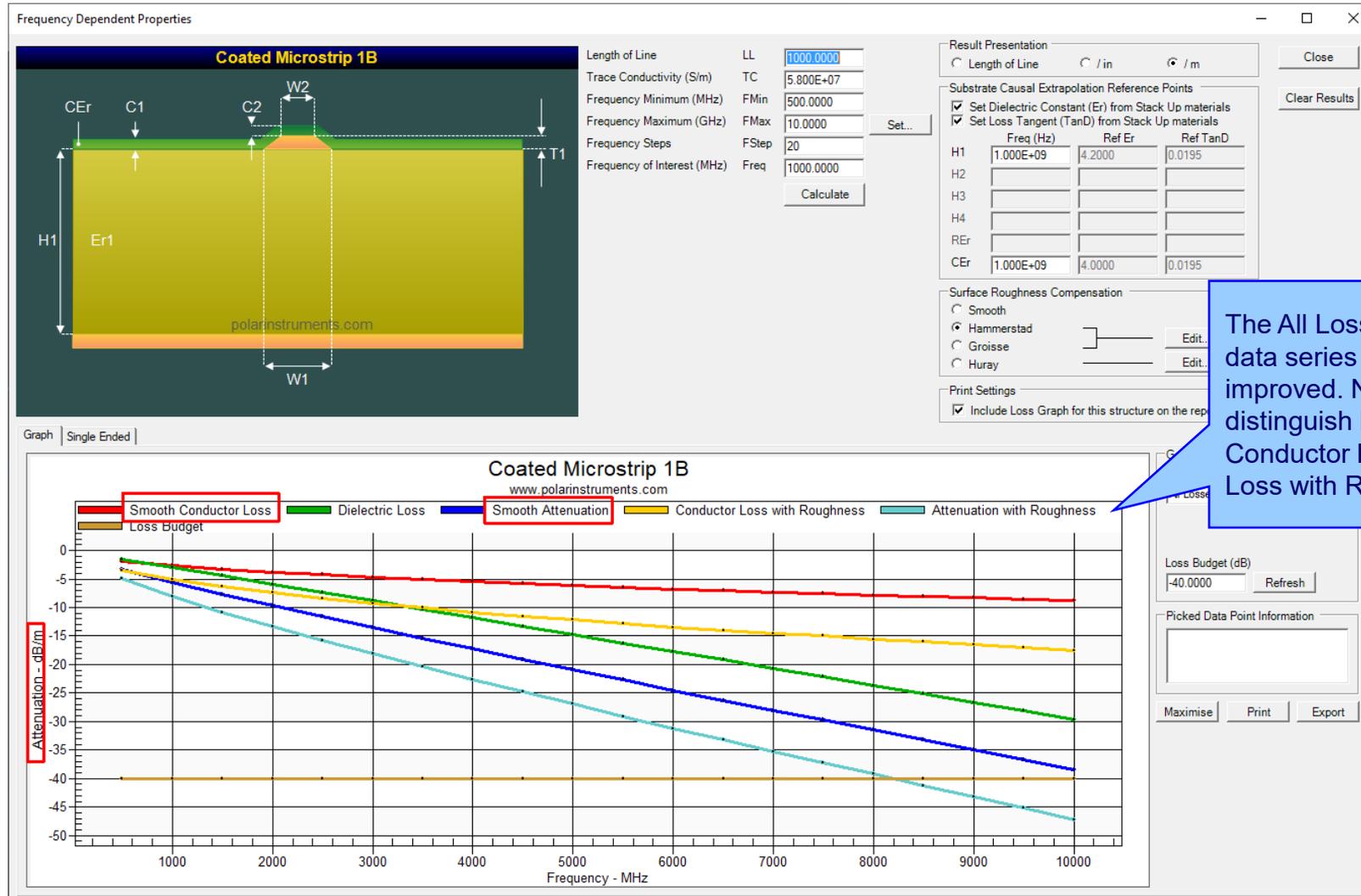
Import / Export enhancements

The following Import / Export options have been updated to support the layer name property introduced with Speedstack v21.05.06:

- XML STKX v21.00 and SSX v11.00 import / export options
- CSV export option
- Gerber / DXF export option

Speedstack v21.04.00 (April 2021)

All Losses plot - clearer labelling



The All Losses plot y-axis and data series labelling has been improved. Now easier to distinguish between Smooth Conductor Loss and Conductor Loss with Roughness

Other enhancements

- The controlled impedance and insertion loss Calculation Engine updated to the latest edition
- Frequency Dependent Calculations graphing library enhancements

Speedstack v21.03.09 (March 2021)

New Apply Plating Colours toolbar option

The screenshot shows the Polar Speedstack Stack Up Builder interface. The main window displays a 3D cross-section of a PCB stack-up with various layers. A toolbar at the top contains several icons, with one icon (a green and yellow square) highlighted by a red box. A blue callout box points to this icon, stating: "New Apply Plating Colours toolbar option. Toggle between standard and enhanced colours".

On the right side of the interface, there is a 'Stack Up Information' panel with a table of values:

Field	Value
Electrical Layer Count	8
Stack Up Cost	54.00
Copper Thickness	11.2000
Dielectric Thickness	49.6600
Solder Mask Thickness	2.0000
=====	
Target Stack Up Thickness	60.0000
Stack Up Thickness	60.8600
Stack Up Thickness with Soldermask	62.8600
=====	

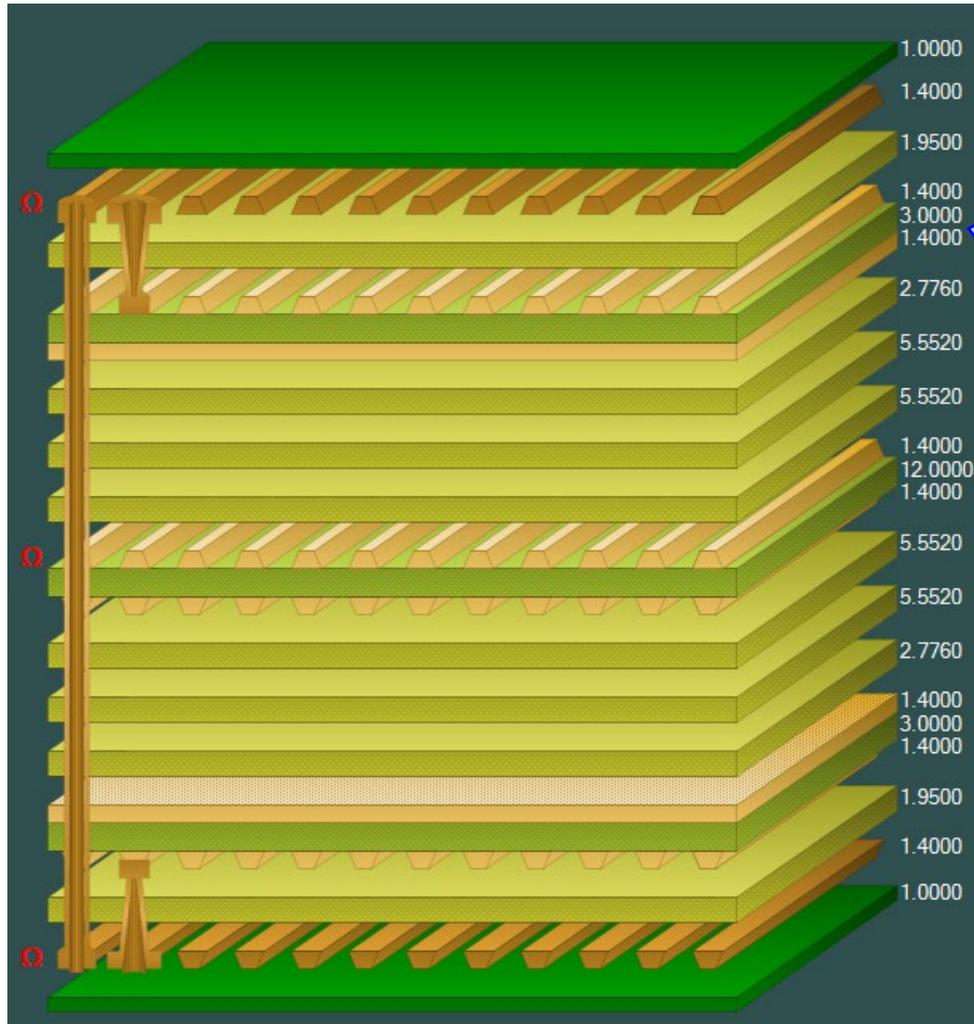
Below this table is a 'Selected Item Information' section which is currently empty.

At the bottom of the interface, a status bar shows: |Mils/Thous | Target Stack Up Thickness = 60.0000 | Stack Up Thickness = 60.8600 | Stack Up Thickness with Soldermask = 62.8600 | V21.03.09

Automatically assign different colours to plated and un-plated copper layers.

Plated layers are determined by checking the copper base and finished thickness. Plated layers are shown as a darker colour

New Apply Plating Colours toolbar option



Plated Copper Layers

During PCB fabrication drill holes commonly have copper applied to the barrel wall by an electroplating process. This provides an interconnect between copper layers in the stack up.

This electroplating process often results in additional copper also being applied to the exposed copper layers where the mechanical drill starts / ends.

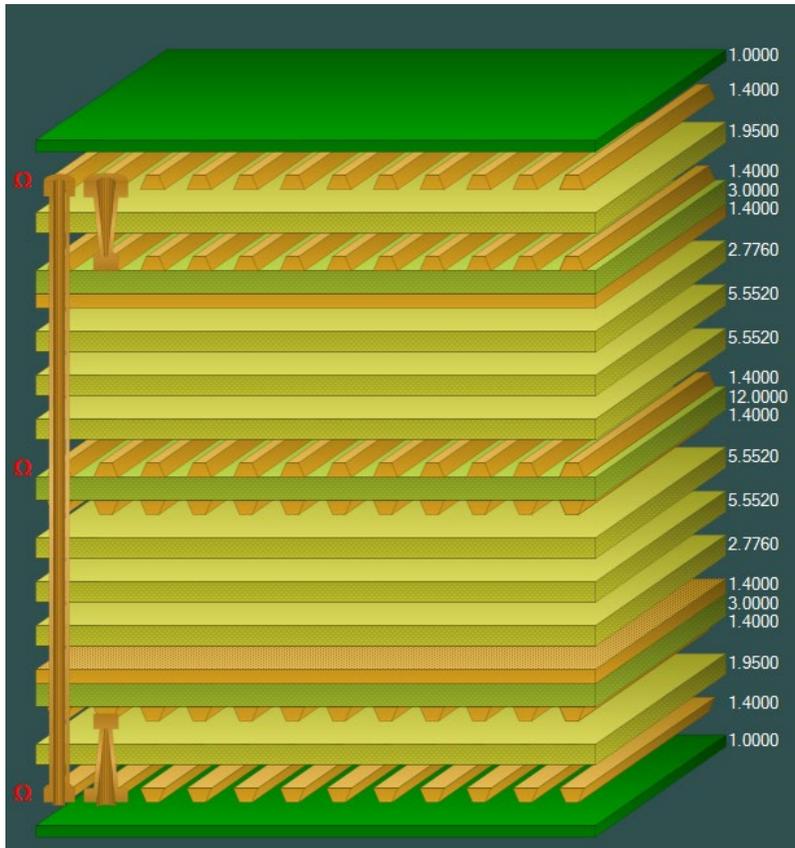
It is important to account for this additional plated copper thickness when calculating the overall stack up thickness and controlled impedance / insertion loss structures.

Speedstack has always allowed this additional plating thickness to be applied to the relevant copper layers. With v21.03 this has been enhanced further with automatic colour assignments to the plated and unplated layers

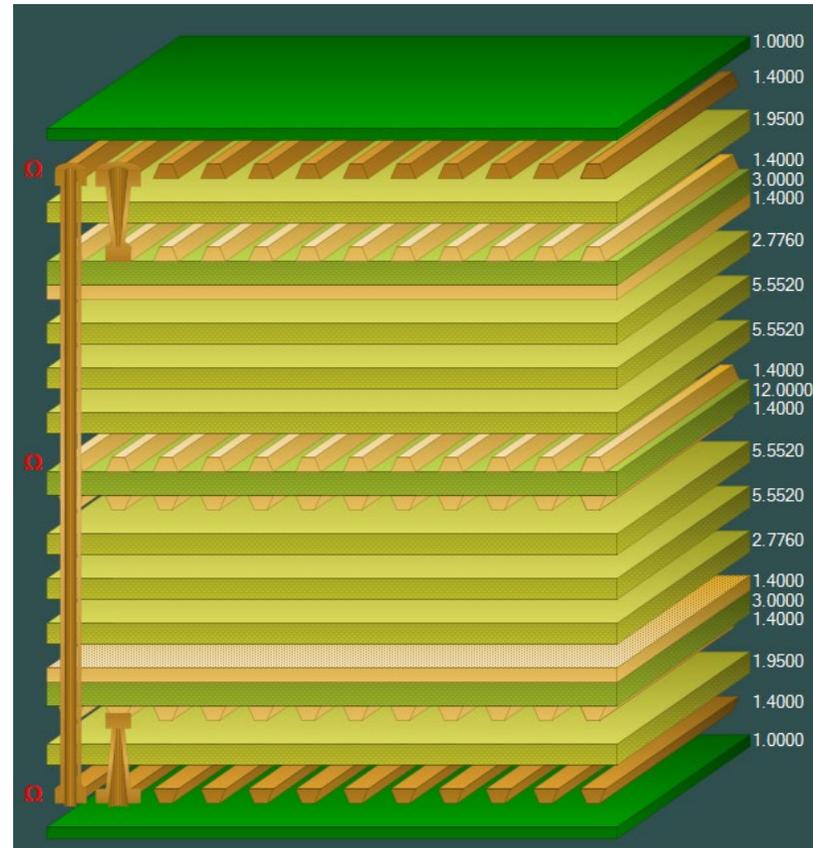
New Apply Plating Colours toolbar option



Standard Colours



Apply Plating Colours



New Apply Plating Colours toolbar option

Speedstack Report Printer

File Options

C:\Appst\Samples\Eval Imperial.sci Units: MILs

Layer	Stack up	Supplier	Description	Type	Processed Thickness	cr	Loss Tangent	Impedance ID
1		Polar Samples	Liquid Photoimageable Mask	SolderMask	1.000	4.000	0.0195	
		Polar Samples	Copper Foil	Copper	1.400			1, 2
2		Polar Samples	PreProg 1080	Dielectric	1.950	4.200	0.0195	
3		Polar Samples	FR4 Core	FR4	1.400	3.000	4.200	0.0195
		Polar Samples	PreProg 3080	Dielectric	2.776	4.200	0.0195	
		Polar Samples	PreProg 1651	Dielectric	5.552	4.200	0.0195	
		Polar Samples	PreProg 1651	Dielectric	5.552	4.200	0.0195	
4		Polar Samples	FR4 Core	FR4	1.400	12.000	4.200	0.0195
		Polar Samples	PreProg 1651	Dielectric	5.552	4.200	0.0195	
		Polar Samples	PreProg 1651	Dielectric	5.552	4.200	0.0195	
		Polar Samples	PreProg 3080	Dielectric	2.776	4.200	0.0195	
5		Polar Samples	FR4 Core	FR4	1.400	3.000	4.200	0.0195
		Polar Samples	PreProg 1080	Dielectric	1.950	4.200	0.0195	
6		Polar Samples	PreProg 1080	Dielectric	1.950	4.200	0.0195	
7		Polar Samples	Copper Foil	Copper	1.400			4
8		Polar Samples	Liquid Photoimageable Mask	SolderMask	1.000	4.000	0.0195	

Copper Thickness = 11.200 | Dielectric Thickness = 49.660 | Solder Mask Thickness = 2.000 | Stack Up Thickness = 60.860 | Stack Up Thickness with Soldermask = 62.860
Stack Up Cost = 54.00

Notes

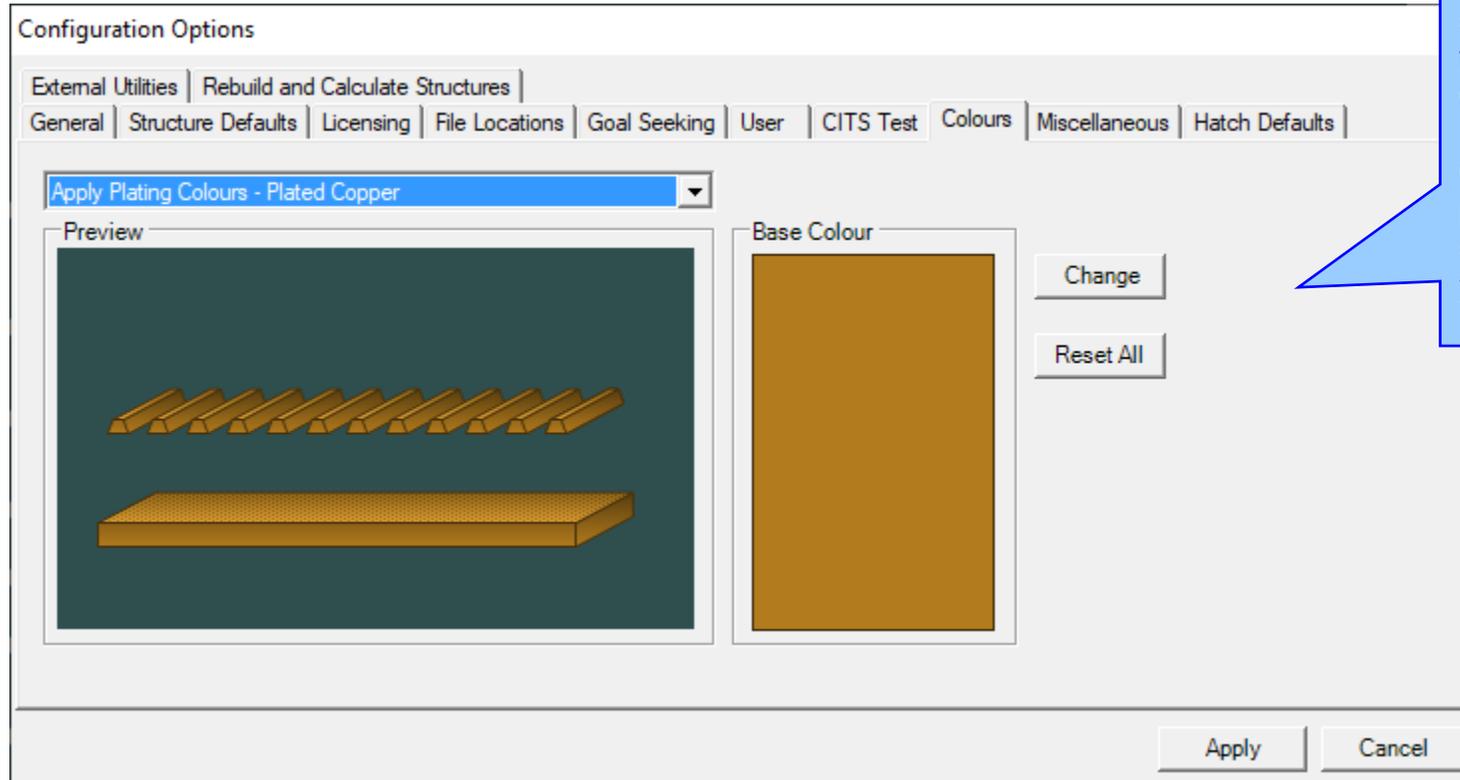
Impedance ID	Structure Image	Structure Name	Impedance Signal Layer	Ref. Plane 1 in Layer	Ref. Plane 2 in Layer	Lower Trace Width (W1)	Upper Trace Width (W2)	Trace Separation (S1)	Target Impedance	Tol (+/- %)	Calculated Impedance
1		Edge Coupled Coated Microstrip 1B	1	3	0	7.650	6.650	8.115	100.000	10.000	100.290
2		Coated Microstrip 1B	1	3	0	4.000	3.000	0.000	75.000	10.000	75.740
3		Edge Coupled Offset Stripline 1B1A	4	3	6	7.250	6.250	8.500	100.000	10.000	101.280

StackName: Master	Version:	Revision:	Modification:	Date of Revision:	Editor:	Page 1/1
Date:	Associated Documents:					
Author:						
Department:						
Site:						

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The technical report will also show the plated and un-plated copper layers.

New Apply Plating Colours toolbar option



Two new user-definable colours have been introduced to the Speedstack Configuration Options.

Customise the Plated and Un-plated colours to suit existing colour schemes adopted by your organisation

Online Library enhancements

The screenshot shows the 'Online Library' window with several callouts:

- Filter by Supplier:** Callouts highlight the logos for **SHOWA DENKO** and **TATSUTA**, with the text: "Showa Denko and Tatsuta have recently joined the Polar Material Partner program".
- File Type:** A list of file types is shown, with **PrePregs** selected.
- Filter by Frequency:** A callout points to the frequency filter options (All, 1 GHz, 5 GHz, 10 GHz, 20 GHz, 50 GHz, 75 GHz) with the text: "Filter downloadable libraries by frequency. The frequency of the dielectric constant (Er) / loss tangent (TanD) material properties".
- Existing Data Table:** Callouts explain the 'Clear' and 'Append' options: "Clear - use this option to clear data from the existing library data table and download a single library" and "Append - use this option to add data to the existing library data table and when downloading multiple libraries during a single session".
- File Access Mode:** A callout points to the 'On-Premise Mode' radio button and the file path input field (C:\Users\vicha\Desktop\Material_Library_2021) with the text: "Improvements to On-Premise Mode to help users where, for security reasons, no Internet connection is available".

At the bottom, a note reads: "Please Note: This data is accurate to the best of our knowledge, however it is provided, as is from our Material supplier partners. Please feedback any errors or inaccuracies to Polarcare and we will contact the material partner for clarification or rectification."

Speedstack v21.02.01 (February 2021)

New Shield material

The screenshot shows the Polar Speedstack Stack Up Builder interface. The main window displays a 3D stack-up model of a PCB with a red box highlighting the top and bottom shield layers. Below the model is a table listing the layers:

Layer	Type	Material	Thickness
1	Shield	EMI Shield Film	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
2	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
4	Shield	EMI Shield Film	4.200/0.0195

At the bottom of the interface, the status bar shows: Target Stack Up Thickness = 30.0000, Stack Up Thickness = 29.6000, Stack Up Thickness with Soldermask = 29.6000, Beta V21.02.01.

Speedstack v21.02 introduces support for a new Shield material type.

Shield materials are used to prevent electromagnetic interference (EMI) from being either absorbed or radiated.

New Shield material

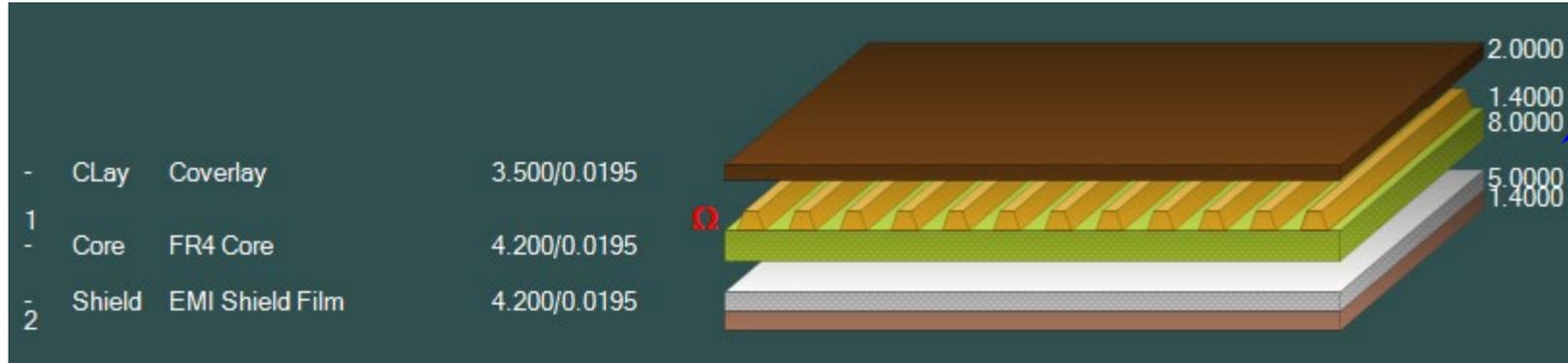
Shields are typically applied to the outer layer(s) of the stack up

1	Shield	EMI Shield Film	4.200/0.0195	1.4000
-	PP	PrePreg 1080	4.200/0.0195	5.0000
2	Core	FR4 Core	4.200/0.0195	3.0000
3				1.4000
-	PP	PrePreg 1080	4.200/0.0195	8.0000
-	PP	PrePreg 1080	4.200/0.0195	1.4000
-	PP	PrePreg 1080	4.200/0.0195	3.0000
4	Shield	EMI Shield Film	4.200/0.0195	5.0000
-	PP	PrePreg 1080	4.200/0.0195	1.4000

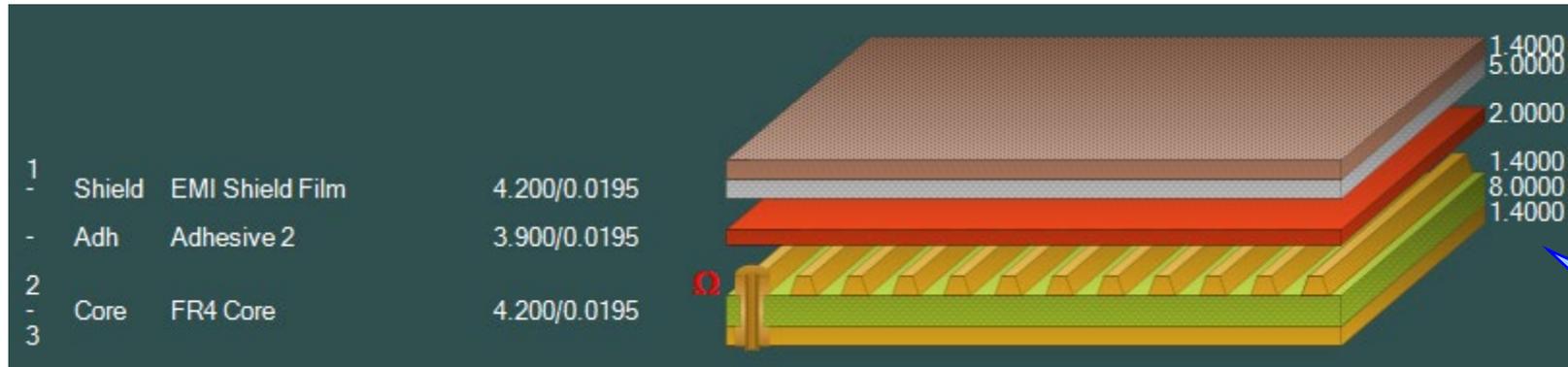


They consist of a shield layer (brown) and dielectric adhesive (silver)

Shield material examples

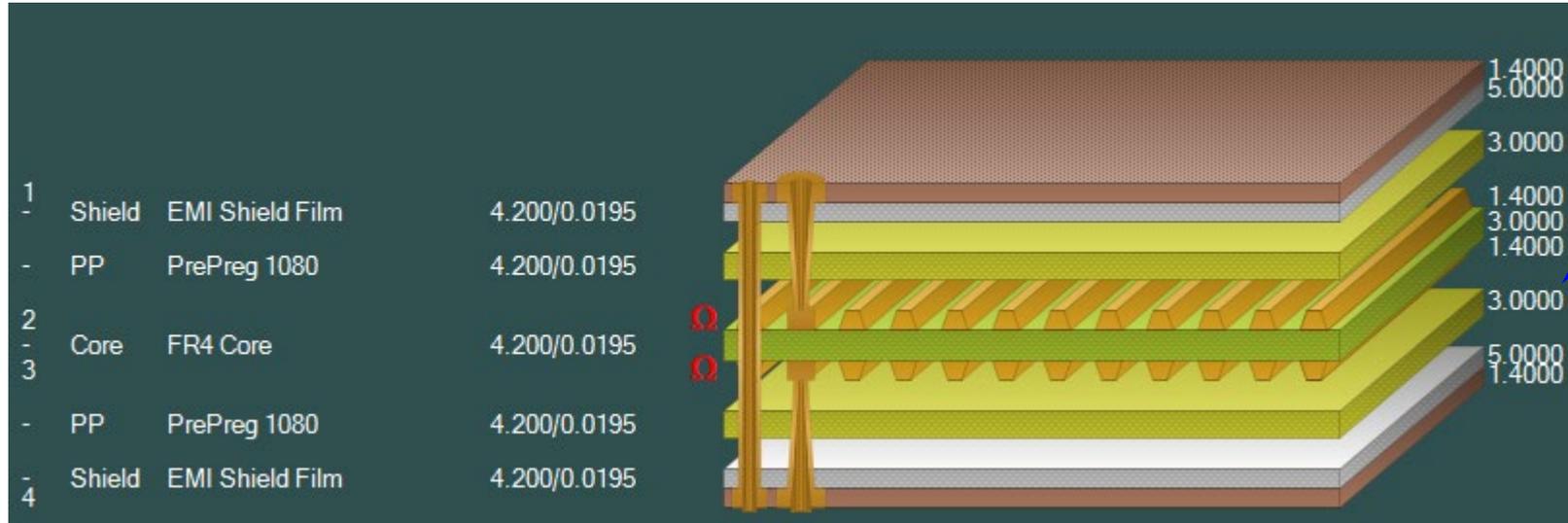


Example #1
Single-sided core,
coverlay above trace,
shield below

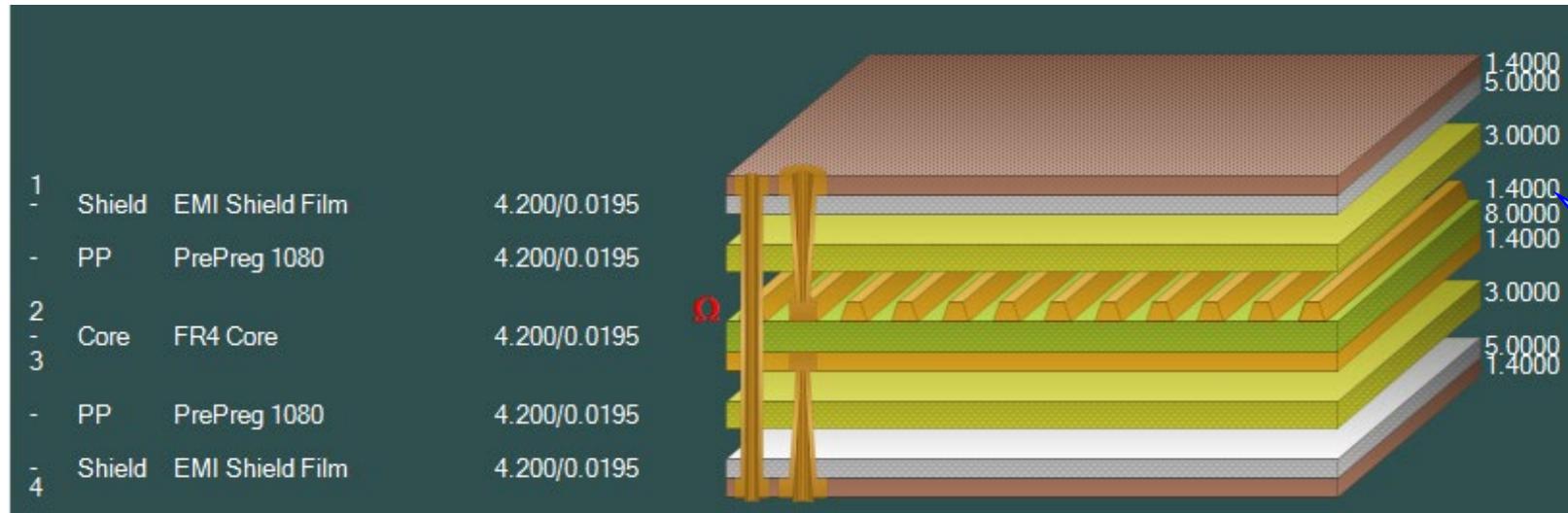


Example #2
Double-sided core,
adhesive and shield
above

Shield material examples

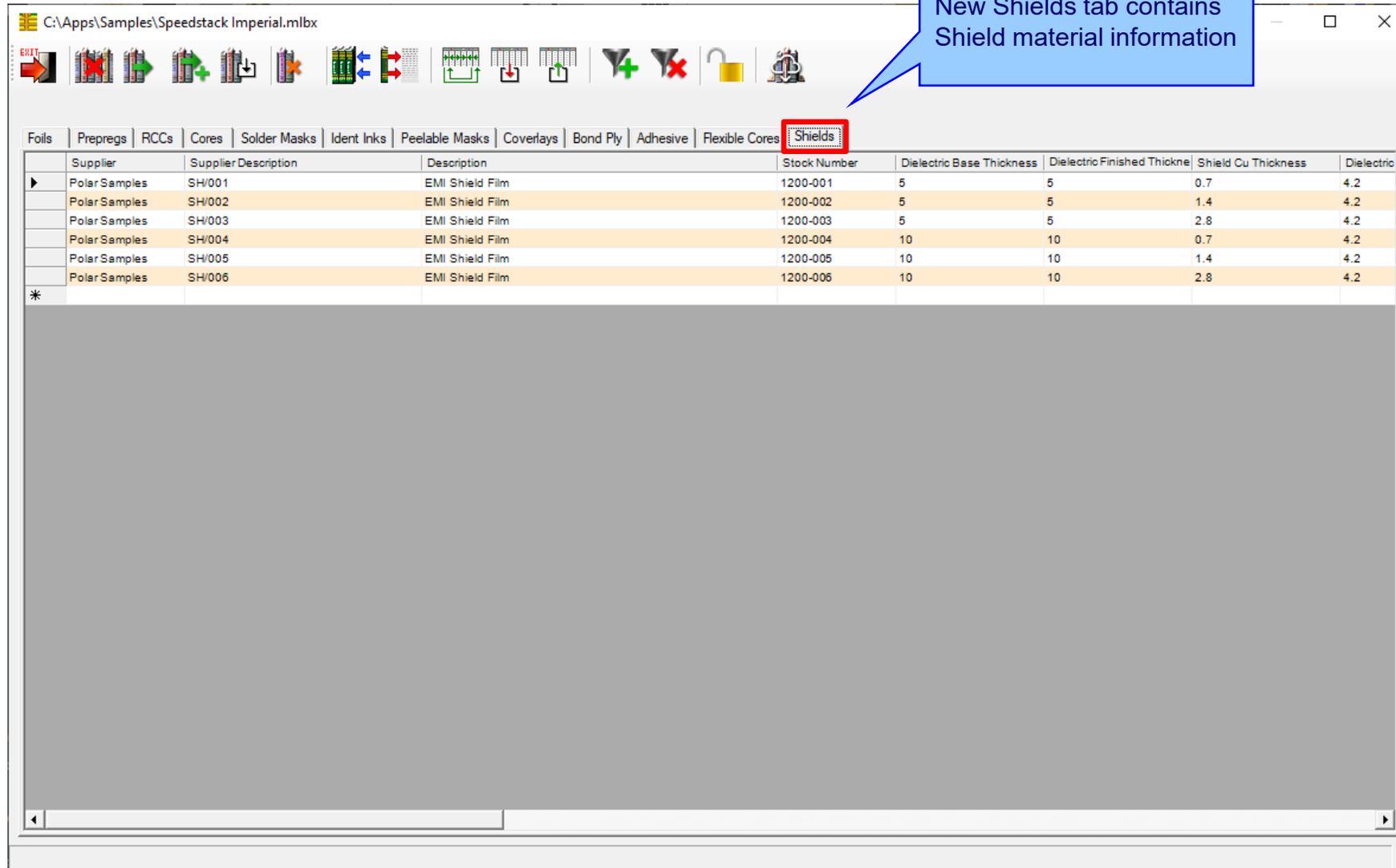


Example #3
 Double-sided core with two signal trace layers with shield above and below trace layers



Example #4
 Double-sided core with one signal trace layer with shield above and below trace layers

Material library enhancements



The screenshot shows the Speedstack software interface with the 'Shields' tab selected in the material library. The 'Shields' tab is highlighted with a red box. A blue callout box points to the 'Shields' tab with the text 'New Shields tab contains Shield material information'.

	Supplier	Supplier Description	Description	Stock Number	Dielectric Base Thickness	Dielectric Finished Thickne	Shield Cu Thickness	Dielectric
▶	Polar Samples	SH/001	EMI Shield Film	1200-001	5	5	0.7	4.2
	Polar Samples	SH/002	EMI Shield Film	1200-002	5	5	1.4	4.2
	Polar Samples	SH/003	EMI Shield Film	1200-003	5	5	2.8	4.2
	Polar Samples	SH/004	EMI Shield Film	1200-004	10	10	0.7	4.2
	Polar Samples	SH/005	EMI Shield Film	1200-005	10	10	1.4	4.2
	Polar Samples	SH/006	EMI Shield Film	1200-006	10	10	2.8	4.2
*								

Material library enhancements

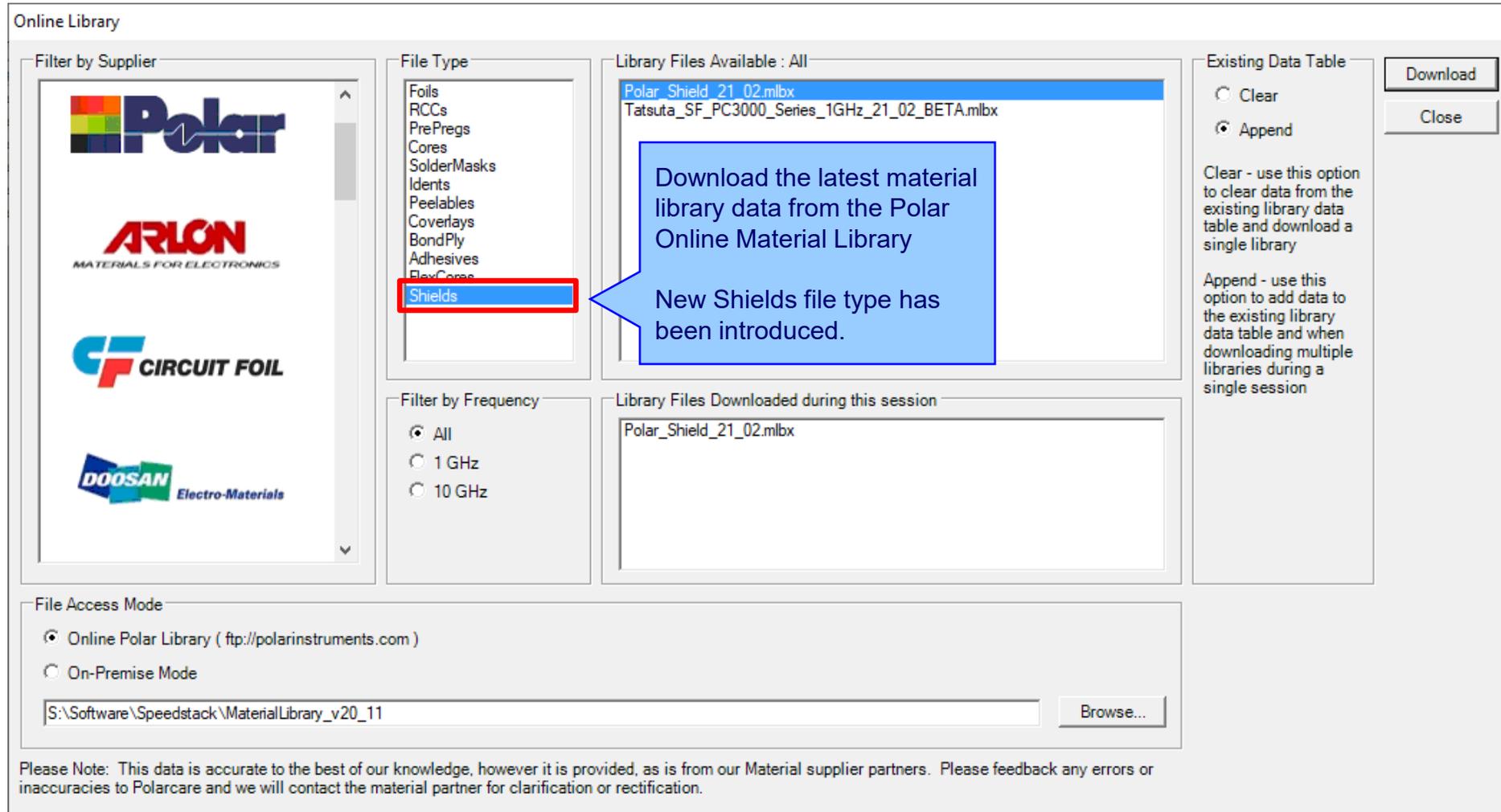
Review/Edit Shield

Supplier	<input type="text" value="Polar Samples"/>	Size	<input type="text" value="*"/>
Supplier Description	<input type="text" value="SH/001"/>	Note 1	<input type="text"/>
Description	<input type="text" value="EMI Shield Film"/>	Note 2	<input type="text"/>
StockNumber	<input type="text" value="1200-001"/>	Note 3	<input type="text"/>
Type	<input type="text" value="Shield"/>	Note 4	<input type="text"/>
Base Thickness	<input type="text" value="5.0000"/>	Note 5	<input type="text"/>
Finished Thickness	<input type="text" value="5.0000"/>		
Dielectric Constant	<input type="text" value="4.2"/>		
Loss Tangent	<input type="text" value="0.0195"/>		
Resin Content	<input type="text" value="0"/>		
Tg	<input type="text" value="0"/>		
Td	<input type="text" value="0"/>		
CAF Resistance	<input type="text" value="0"/>		
Z Axis Expansion	<input type="text" value="0"/>		
Excess Resin	<input type="text" value="0.0000"/>		
Tolerance +/-%	<input type="text" value="10"/>		
Shield Copper Thickness	<input type="text" value="0.7000"/>		
Cost	<input type="text" value="0"/>		
Lead Time	<input type="text" value="0"/>		
Laser Drillable	<input type="checkbox"/>		

1 of 6

Material library Edit Shield dialog

Online Library enhanced to support Shield materials



Online Library

Filter by Supplier

- Polar
- ARLON MATERIALS FOR ELECTRONICS
- CIRCUIT FOIL
- DOOSAN Electro-Materials

File Type

- Foils
- RCCs
- PrePregs
- Cores
- SolderMasks
- Idents
- Peelables
- Coverlays
- BondPly
- Adhesives
- FlexCores
- Shields**

Library Files Available : All

- Polar_Shield_21_02.mlbx
- Tatsuta_SF_PC3000_Series_1GHz_21_02_BETA.mlbx

Existing Data Table

Clear

Append

Clear - use this option to clear data from the existing library data table and download a single library

Append - use this option to add data to the existing library data table and when downloading multiple libraries during a single session

Download

Close

Filter by Frequency

All

1 GHz

10 GHz

Library Files Downloaded during this session

- Polar_Shield_21_02.mlbx

File Access Mode

Online Polar Library (ftp://polarinstruments.com)

On-Premise Mode

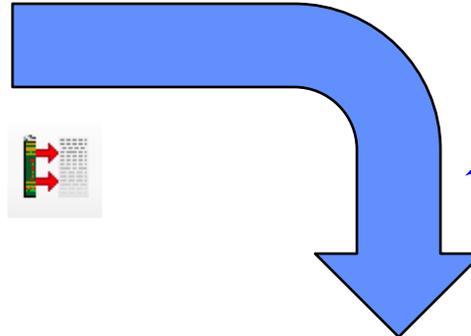
S:\Software\Speedstack\MaterialLibrary_v20_11

Browse...

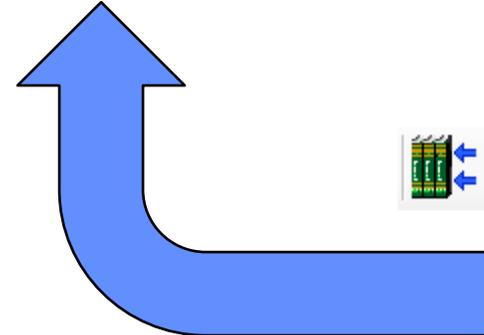
Please Note: This data is accurate to the best of our knowledge, however it is provided, as is from our Material supplier partners. Please feedback any errors or inaccuracies to Polarcare and we will contact the material partner for clarification or rectification.

Export / Import Shield library to Excel

Supplier	Supplier Description	Description	Stock Number	Dielectric Base Thickness	Dielectric Finished Thickness	Shield Cu Thickness	Dielectric
Polar Samples	SH001	EMI Shield Film	1200-001	5	5	0.7	4.2
Polar Samples	SH002	EMI Shield Film	1200-002	5	5	1.4	4.2
Polar Samples	SH003	EMI Shield Film	1200-003	5	5	2.8	4.2
Polar Samples	SH004	EMI Shield Film	1200-004	10	10	0.7	4.2
Polar Samples	SH005	EMI Shield Film	1200-005	10	10	1.4	4.2
Polar Samples	SH006	EMI Shield Film	1200-006	10	10	2.8	4.2

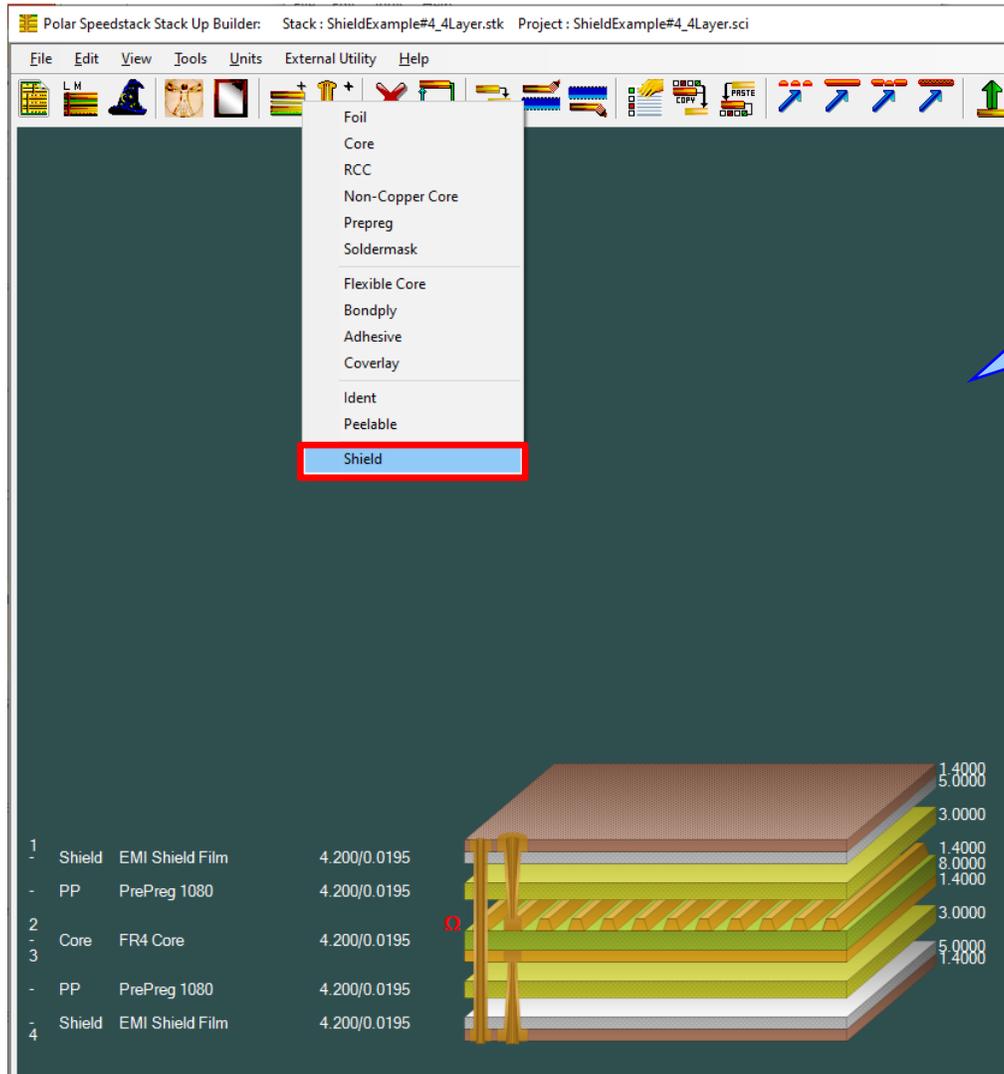


It is possible to export / import Shield library data with 3rd part tools like Excel



Type	Supplier	Supplier Description	Description	Stock Number	Shield Cu Thickness	Dielectric Base Thickness	Dielectric Finished Thickness	Dielectric Constant	Dielectric Loss Tangent	Dielectric Resin Content	Tg	Td	Dielectric CAF Resistance	Dielectric ZAxisExpansion	Dielectric ExcessResin	Dielectric Tolerance	Dielectric LaserDrillable	
Shield	Polar Samples	SH/001	EMI Shield Film	1200-001	0.7	5	5	4.2	0.0195	0	0	0	0	0	0	0	10	FALSE
Shield	Polar Samples	SH/002	EMI Shield Film	1200-002	1.4	5	5	4.2	0.0195	0	0	0	0	0	0	0	10	FALSE
Shield	Polar Samples	SH/003	EMI Shield Film	1200-003	2.8	5	5	4.2	0.0195	0	0	0	0	0	0	0	10	FALSE
Shield	Polar Samples	SH/004	EMI Shield Film	1200-004	0.7	10	10	4.2	0.0195	0	0	0	0	0	0	0	10	FALSE
Shield	Polar Samples	SH/005	EMI Shield Film	1200-005	1.4	10	10	4.2	0.0195	0	0	0	0	0	0	0	10	FALSE
Shield	Polar Samples	SH/006	EMI Shield Film	1200-006	2.8	10	10	4.2	0.0195	0	0	0	0	0	0	0	10	FALSE

Stack up editor enhancements



Stack Up editor enhancements:

Shield material options to add, delete, swap, move up, move down, symmetry and set properties

Shield properties

Shield Properties

Main | Notes | Attributes

General Information

Supplier: Polar Samples
 Supplier Description: SH/002
 Description: EMI Shield Film
 Stock Number: 1200-002
 Type: Shield

Shield Copper

Base Thickness: 1.4000
 Finished Thickness: 1.4000
 Data Filename:
 Trace Inverted:
 Finishing Applied:
 Copper Coverage %: 0.00
 Graphical Colour:
 Remove Copper (disabled if structures or sub-stacks exist):

Shield Dielectric

Base Thickness: 5.0000
 Finished Thickness: 5.0000
 Dielectric Constant: 4.2000
 Loss Tangent: 0.0195
 Resin Content %: 0.00
 Tg: 0.0
 Td: 0.0
 CAF Resistance: 0.0
 Z Axis Expansion: 0.0
 Excess Resin: 0.0000
 Isolation Distance: 5.0000
 Graphical Colour:
 Data Filenames

Dielectric Base Thickness	5.0000
Dielectric Finished Thickness	5.0000
Dielectric Constant	4.2
Loss Tangent	0.0195
Resin Content	0
Tg	0
Td	0
CAF Resistance	0
Z Axis Expansion	0
Excess Resin	0.0000

Stack-up diagram showing layers: Shield (EMI Shield Film), PP (PrePreg 1080), Core (FR4 Core), PP (PrePreg 1080), Shield (EMI Shield Film). Thicknesses are listed on the right of the diagram.

View and customise the Shield properties. Useful in 'what-if' scenarios

Controlled impedance and insertion loss calculations

The screenshot shows the Polar Speedstack Stack Up Builder interface. The main window displays a 3D stack up model with a red box highlighting the top layer, labeled "Shield material in stack up". Below the model is a table listing the layers:

Layer	Material	Thickness (Mils/Thous)
1	Shield EMI Shield Film	3.500/0.0180
-	PP PrePreg 1080	4.200/0.0195
2	Core FR4 Core	4.200/0.0195
-	PP PrePreg 1080	4.200/0.0195
3	Shield EMI Shield Film	4.200/0.0195

On the right side, the "Controlled Impedance" results are shown. A red box highlights the "Substrate 3 Height" and "Substrate 3 Dielectric" values:

Substrate 1 Height	H1	8.0000
Substrate 1 Dielectric	Er1	4.2000
Substrate 2 Height	H2	4.4000
Substrate 2 Dielectric	Er2	4.2000
Substrate 3 Height	H3	5.0000
Substrate 3 Dielectric	Er3	3.5000
Lower Trace Width	W1	6.4000
Upper Trace Width	W2	5.4000
Trace Thickness	T1	1.4000
Impedance	Zo	50.46
Target Impedance		50.00
Target Tolerance %		10.00

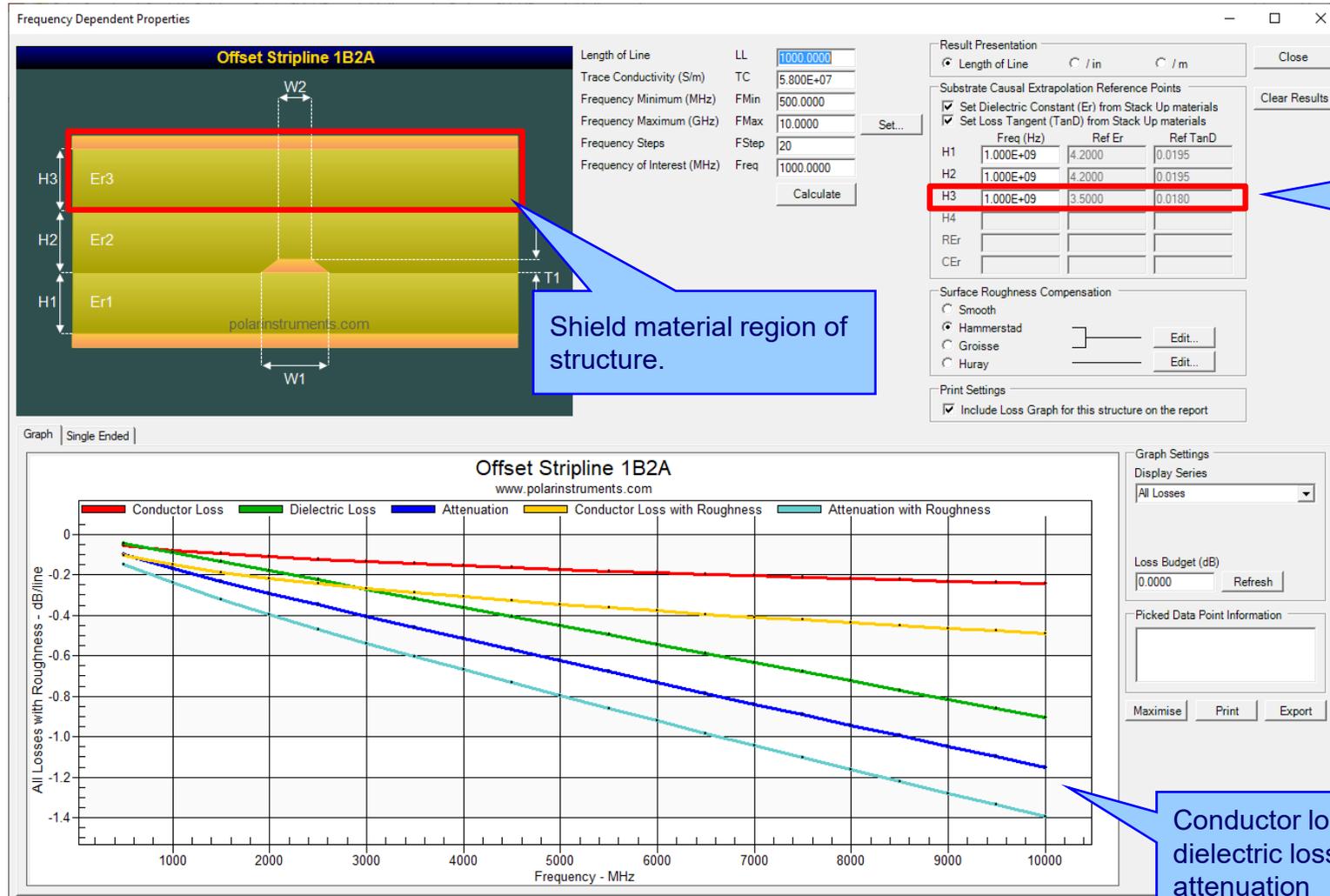
The top right of the interface shows a diagram of the "Offset Stripline 102A" structure with dimensions W1, W2, H1, H2, H3, and T1. A red box highlights the top layer (Er3, H3) in this diagram, labeled "Shield material region of structure".

Impedance and insertion calculations support the new Shield material type.

Shield material region of structure.

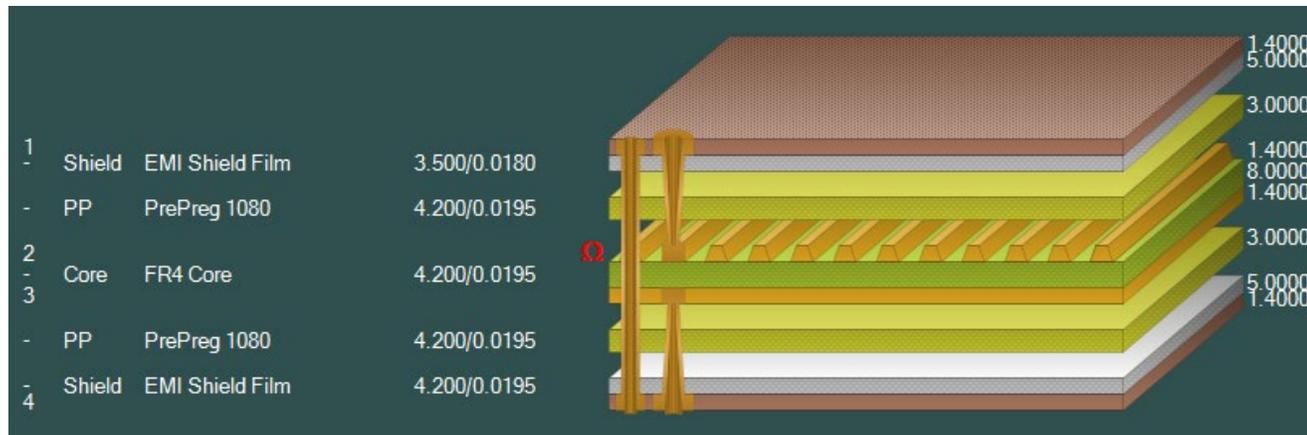
Shield adhesive height / thickness dimension and dielectric constant.

Controlled impedance and insertion loss calculations



Controlled impedance and insertion loss calculations

Please note: Speedstack is capable of supporting many shield types for stack up design and documentation. However, it is important to use the correct type of shield material for controlled impedance and insertion loss applications. They are often designated by the shield vendor as ‘for high speed signal transmission applications’.



Technical report enhancements

Technical report showing shield materials

Speedstack Report Printer
File Options

C:\Apps\Samples\ShieldExample\F5_4layer.sci Units: Mils

Layer	Stack up	Supplier	Description	Type	Processed Thickness	εr	Loss Tangent	Impedance ID
1		Polar Samples	EMI Shield Film	Shield	1.400	5.000	3.500	0.0180
		Polar Samples	PrePreg 1080	Dielectric	3.000	4.200	0.0195	
		Polar Samples	FR4 Core	FR4	1.400	8.000	4.200	0.0195
3		Polar Samples	PrePreg 1080	Dielectric	3.000	4.200	0.0195	
		Polar Samples	EMI Shield Film	Shield	1.400	5.000	4.200	0.0195
4					1.400			

Copper Thickness = 5.600 | Dielectric Thickness = 24.000 | Solder Mask Thickness = 0.000 | Stack Up Thickness = 29.600 | Stack Up Thickness with Soldermask = 29.600
Stack Up Cost = 19.00

Notes

Impedance ID	Structure Image	Structure Name	Impedance Signal Layer	Ref. Plane 1 in Layer	Ref. Plane 2 in Layer	Lower Trace Width (W1)	Upper Trace Width (W2)	Trace Separation (S1)	Target Impedance	Tol (+/- %)	Calculated Impedance
1		Offset Stripline 1B2A	2	1	3	6.400	5.400	0.000	50.000	10.000	50.460
2		Edge Coupled Offset Stripline 1B2A	2	1	3	5.000	4.000	8.800	100.000	10.000	100.010

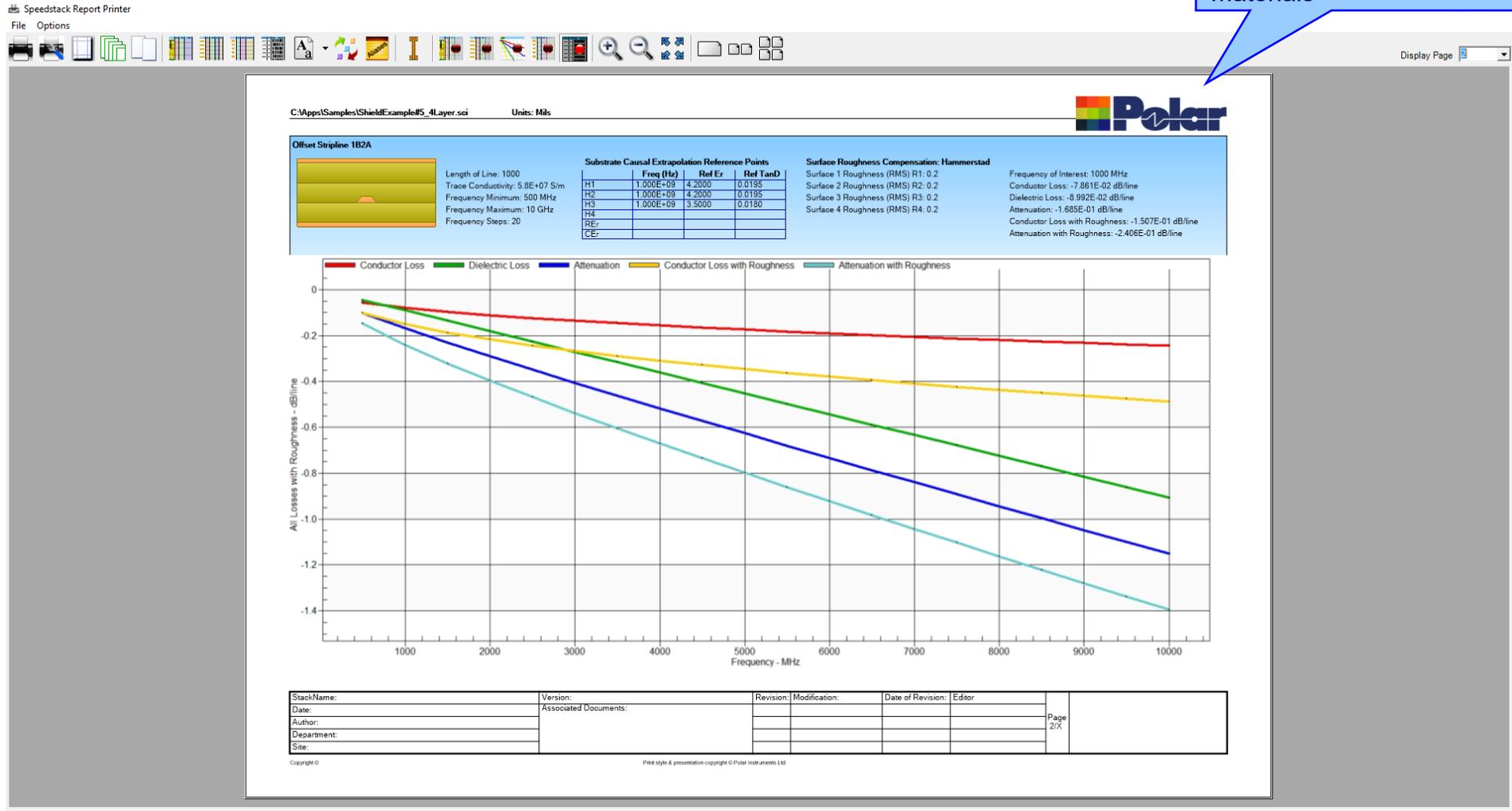
Drill Image	1st Layer	2nd Layer	Column Position	Drill Type
	1	2	2	Laser PTH
	1	4	1	Mechanical PTH
	4	3	2	Laser PTH

StackName: Master	Version:	Revision:	Modification:	Date of Revision:	Editor	Page 1/1
Date:	Associated Documents:					
Author:						
Department:						
Site:						

Copyright © Polar Instruments Ltd

Technical report enhancements

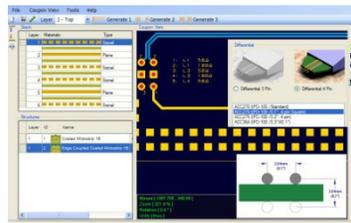
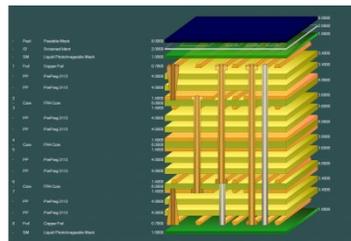
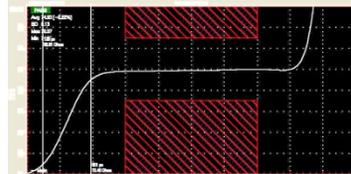
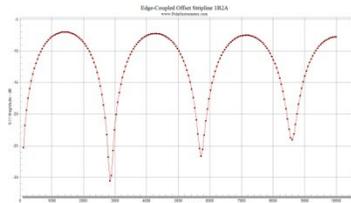
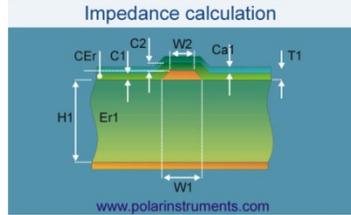
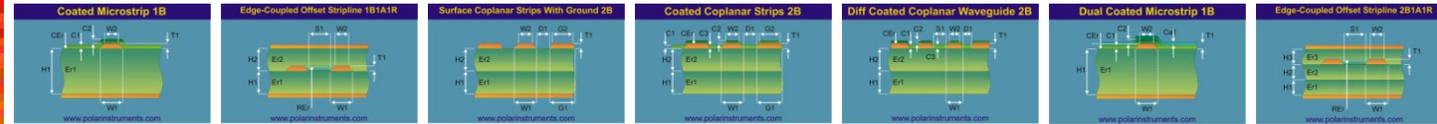
Insertion loss report supporting shield materials



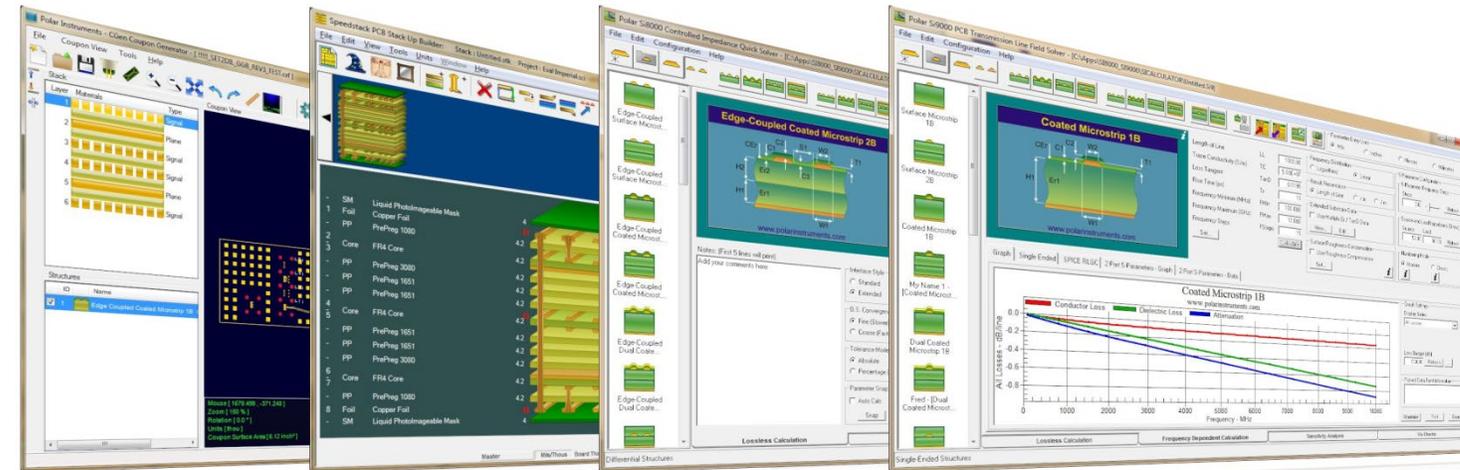
Import / Export enhancements

The following Import / Export options have been updated to support the new shield material introduced with Speedstack 2021:

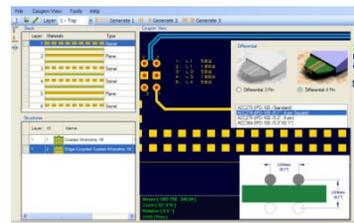
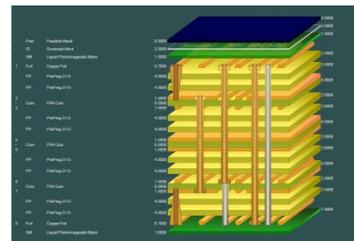
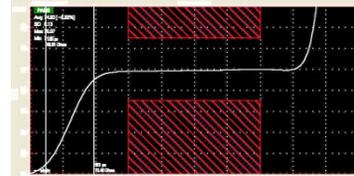
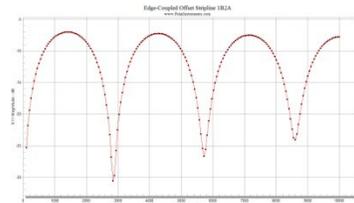
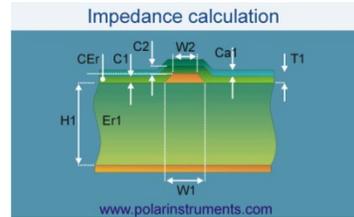
- XML STKX v20.00 and SSX v10.00 import / export options
- CSV export option
- Gerber / DXF export option



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