



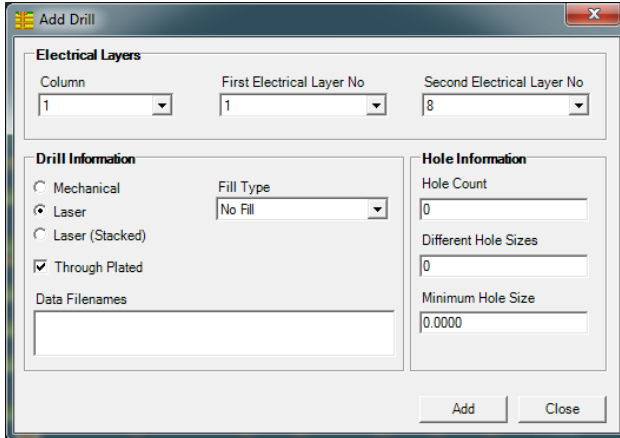
## Introducing Speedstack 2020

Welcome to Speedstack 2020.

We have introduced a number of new features that have been requested through our Polarcare software maintenance service.

If you would like to have a web-based demonstration please contact your local Polar office, details are shown on the last slide of this presentation.

## Drilling enhancements

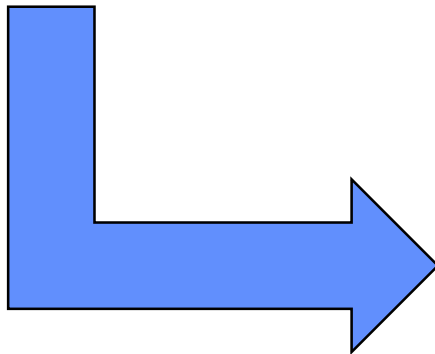
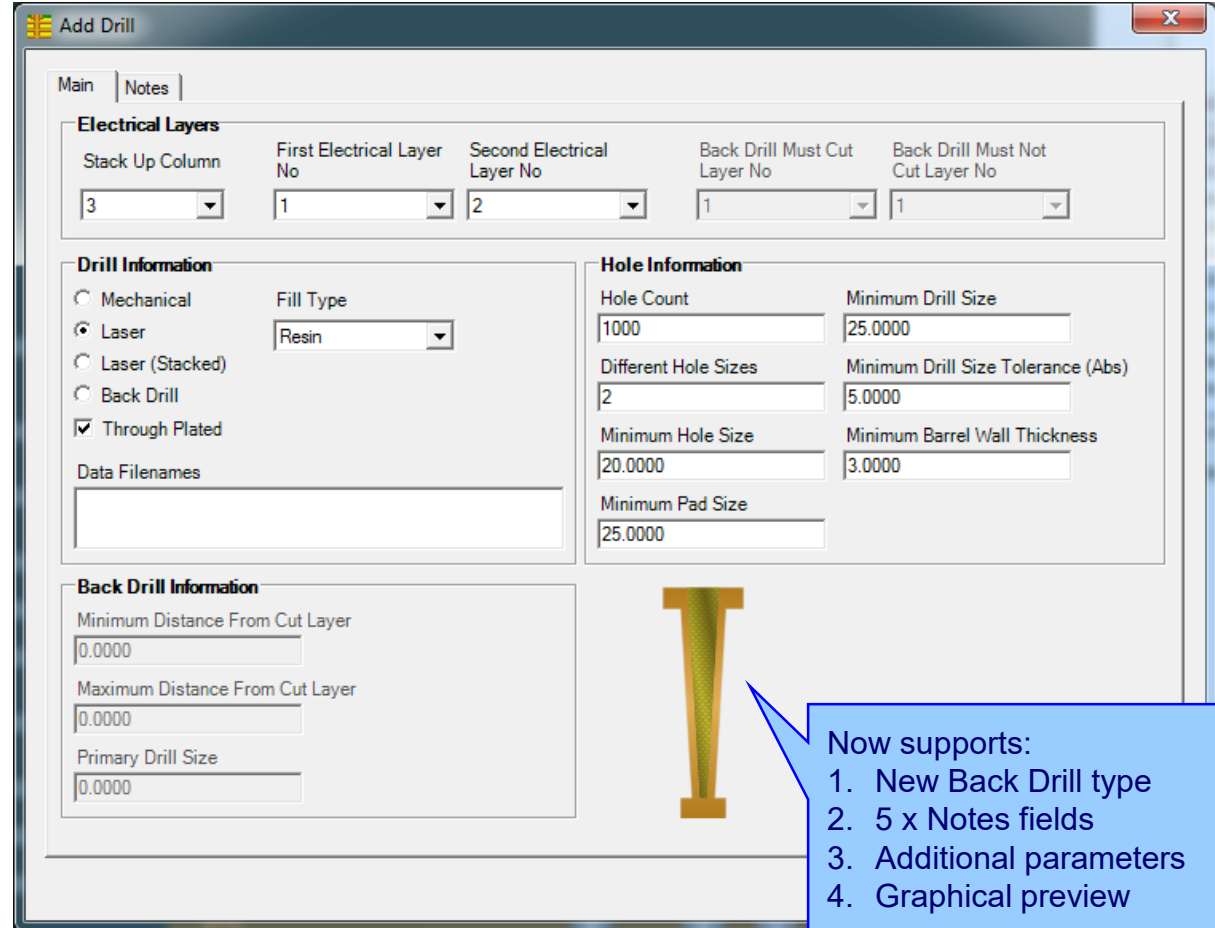


The 'Current Add Drill dialog' is a simple window with the following fields:

- Electrical Layers:**
  - Column: 1
  - First Electrical Layer No: 1
  - Second Electrical Layer No: 8
- Drill Information:**
  - Radio buttons: Mechanical, **Laser**, Laser (Stacked)
  - Fill Type: No Fill
  - ☒ Through Plated
  - Data Filenames: (empty)
- Hole Information:**
  - Hole Count: 0
  - Different Hole Sizes: 0
  - Minimum Hole Size: 0.0000

Buttons: Add, Close

Current Add Drill dialog

The 'Enhanced Add Drill dialog' is a more complex window with the following fields:

- Electrical Layers:**
  - Stack Up Column: 3
  - First Electrical Layer No: 1
  - Second Electrical Layer No: 2
  - Back Drill Must Cut Layer No: 1
  - Back Drill Must Not Cut Layer No: 1
- Drill Information:**
  - Radio buttons: Mechanical, **Laser**, Laser (Stacked), Back Drill
  - Fill Type: Resin
  - ☒ Through Plated
  - Data Filenames: (empty)
- Hole Information:**
  - Hole Count: 1000
  - Minimum Drill Size: 25.0000
  - Different Hole Sizes: 2
  - Minimum Drill Size Tolerance (Abs): 5.0000
  - Minimum Hole Size: 20.0000
  - Minimum Barrel Wall Thickness: 3.0000
  - Minimum Pad Size: 25.0000
- Back Drill Information:**
  - Minimum Distance From Cut Layer: 0.0000
  - Maximum Distance From Cut Layer: 0.0000
  - Primary Drill Size: 0.0000

Buttons: Main, Notes

A graphical preview of a drill bit is shown on the right side of the dialog.

- Now supports:
1. New Back Drill type
  2. 5 x Notes fields
  3. Additional parameters
  4. Graphical preview

Enhanced Add Drill dialog with improved functionality

## New Back Drill type

**Add Drill**

Main | Notes

**Electrical Layers**

Stack Up Column: 3 | First Electrical Layer No: 8 | Second Electrical Layer No: 7 | Back Drill Must Cut Layer No: 7 | Back Drill Must Not Cut Layer No: 6

**Drill Information**

☐ Mechanical  
☐ Laser  
☐ Laser (Stacked)  
☒ **Back Drill**  
☐ Through Plated

Fill Type: No Fill

Data Filenames:

**Hole Information**

Hole Count: 1000 | Minimum Drill Size: 55.0000  
 Different Hole Sizes: 2 | Minimum Drill Size Tolerance (Abs): 5.0000  
 Minimum Hole Size: 50.0000 | Minimum Barrel Wall Thickness: 0.0000  
 Minimum Pad Size: 0.0000

**Back Drill Information**

Minimum Distance From Cut Layer: 5.0000  
 Maximum Distance From Cut Layer: 5.0000  
 Primary Drill Size: 30.0000

Graphical preview of drill to be added, in this case a Back Drill

Add Close

Back drills require the nomination of the Must Cut Layer (MC) and Must Not Cut Layer (MNC)

New Back Drill option

Important Back Drill information is entered here

Graphical preview of drill to be added, in this case a Back Drill

The diagram illustrates a 16-layer PCB stackup with the following layers and properties:

Layer	Material	Thickness (mm)	Dielectric Constant (Dk)	Notes
1	FR-4	0.195	4.000	Top Layer
2	FR-4	0.195	4.200	
3	FR-4	0.195	4.200	
4	FR-4	0.195	4.200	
5	FR-4	0.195	4.200	
6	FR-4	0.195	4.200	Must Not Cut Layer 6
7	FR-4	0.195	4.200	Must Cut Layer 7
8	FR-4	0.195	4.200	Layer 8
9	FR-4	0.195	4.200	
10	FR-4	0.195	4.200	
11	FR-4	0.195	4.200	
12	FR-4	0.195	4.200	
13	FR-4	0.195	4.200	
14	FR-4	0.195	4.200	
15	FR-4	0.195	4.200	
16	FR-4	0.195	4.000	Bottom Layer

Additional details: The stackup includes a central core (FR-4) and two prepreg layers (FR-4) on either side. The total thickness is 4.000 mm. The dielectric constant (Dk) is 4.000 for the top and bottom layers, and 4.200 for the inner layers. The bottom layer is labeled 'Layer 8' and 'Must Cut Layer 7'.



A 3D visualization of a multi-layered structure, possibly a composite material or a stack of thin plates. The structure is composed of numerous horizontal layers, each with a different color and texture. The layers are stacked vertically, with a green base and a green top. The layers are labeled with numerical values on the right side, ranging from 1.0000 at the top to 1.0000 at the bottom. A red box highlights a specific region within the structure, containing several vertical, hatched bars. The bars are of varying heights and are positioned within the layers. The overall structure is supported by a wooden frame on the left and right sides.

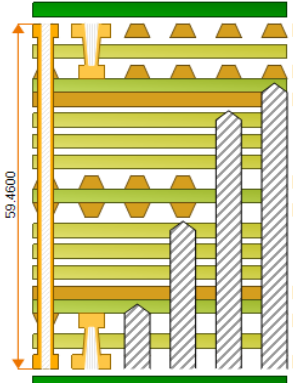
Other examples of the new Speedstack Back Drill capability. Although this is not a 'real world' stack up it does show how back drills can be added using the Must Cut / Must Not Cut methodology

## New Back Drill type

C:\Program Files\Polar\Speedstack\Samples\Eval Imperial Back Drill v17.sci





Units: Mils



Layer	Stack up	Description	Processed Thickness	sr	Loss Tangent	Impedance ID
1		Liquid PhotoImageable Mask	1.000	4.000	0.0195	
		Copper Foil	0.700			1, 2
		PrePreg 1080	1.950	4.200	0.0195	
2			1.400			
		FR4 Core	3.000	4.200	0.0195	
3			1.400			
		PrePreg 3080	2.776	4.200	0.0195	
		PrePreg 1651	5.552	4.200	0.0195	
4		PrePreg 1651	5.552	4.200	0.0195	
			1.400			3
		FR4 Core	12.000	4.200	0.0195	
5			1.400			
		PrePreg 1651	5.552	4.200	0.0195	
		PrePreg 1651	5.552	4.200	0.0195	
		PrePreg 3080	2.776	4.200	0.0195	
6			1.400			
		FR4 Core	3.000	4.200	0.0195	
7			1.400			
		PrePreg 1080	1.950	4.200	0.0195	
8		Copper Foil	0.700			4
		Liquid PhotoImageable Mask	1.000	4.000	0.0195	

The Speedstack technical report option has been enhanced to document the new Back Drill capability.

Copper Thickness = 9.800 | Dielectric Thickness = 49.660 | Solder Mask Thickness = 2.000 | Stack Up Thickness = 59.460 | Stack Up Thickness with Soldermask = 61.460

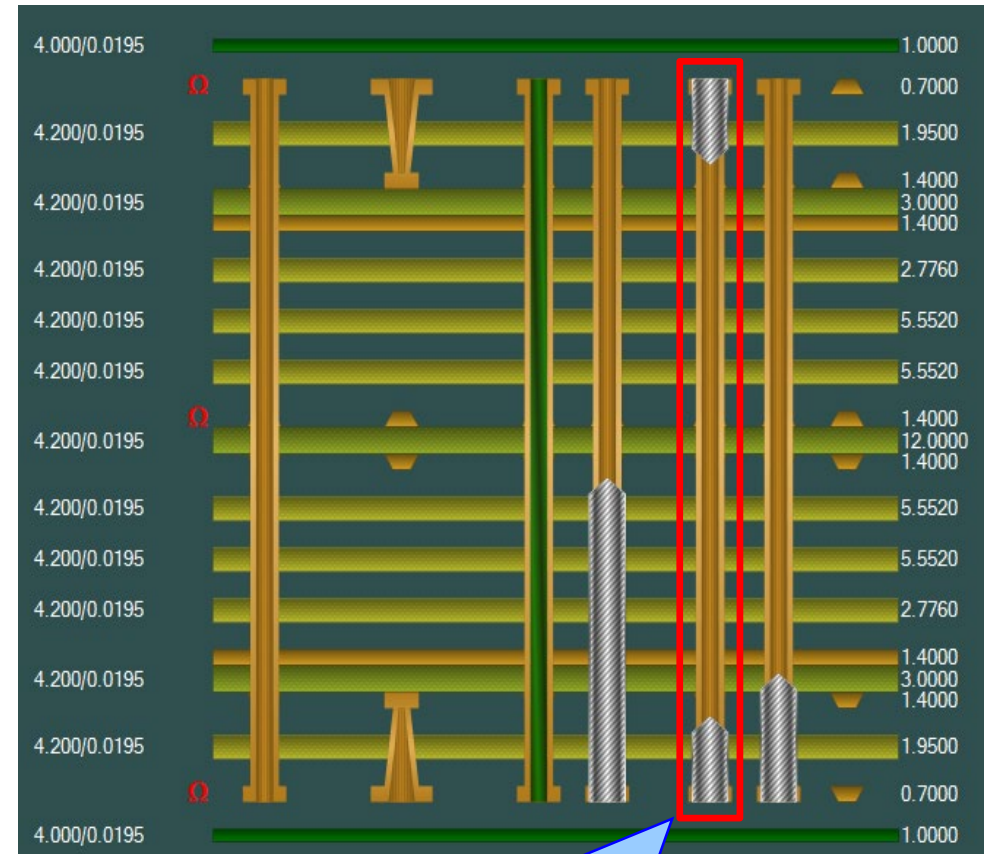
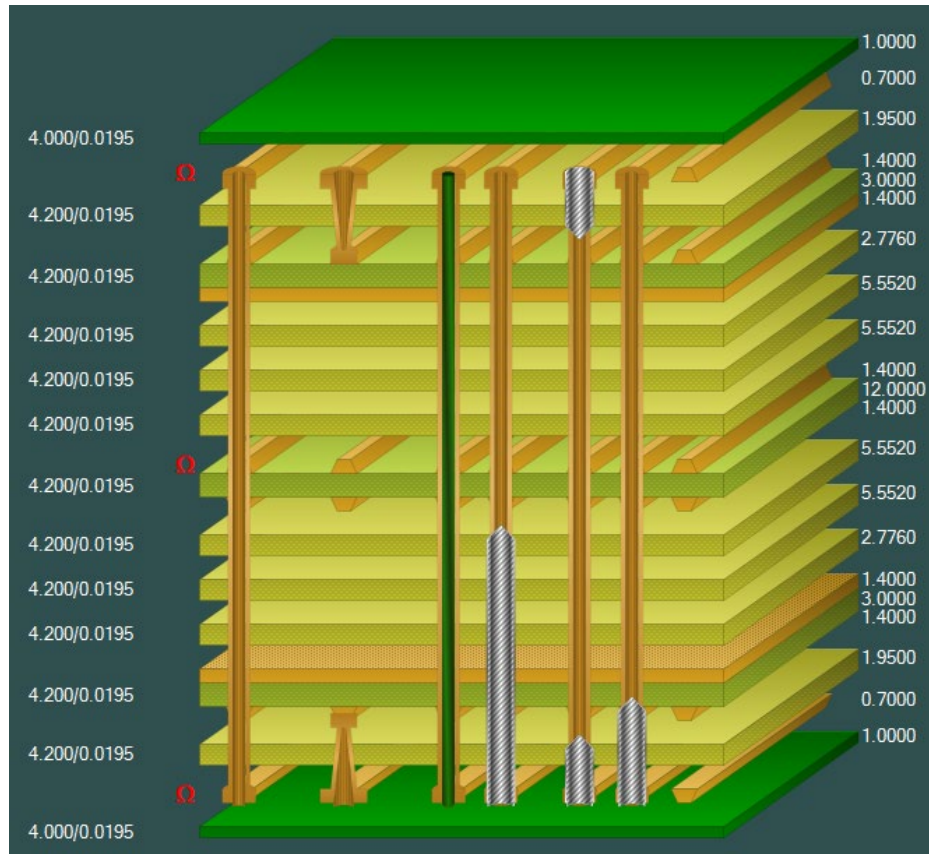
Impedance ID	Structure Image	Impedance Signal Layer	Ref. Plane 1 in Layer	Ref. Plane 2 in Layer	Lower Trace Width (W1)	Upper Trace Width (W2)	Trace Separation (S1)	Target Impedance	Tol (+/- %)	Calculated Impedance
1		1	3	0	8.500	7.500	8.115	100.000	10.000	100.350
2		1	3	0	4.500	3.500	0.000	75.000	10.000	75.870
3		4	3	6	7.250	6.250	8.500	100.000	10.000	101.280
4		8	6	0	4.500	3.500	0.000	75.000	10.000	75.870

StackName: Master		Revision:		Modification:		Date of Revision:		Editor		Page 1/X
Drawing No:										
Date:										
Author:										
Department:										
Site:										

Copyright ©

Print style & presentation copyright © Polar Instruments Ltd

## New Back Drill type



It is also possible to overlay Back Drills on top of existing through-plated drills, to document the complete back drilled via structure

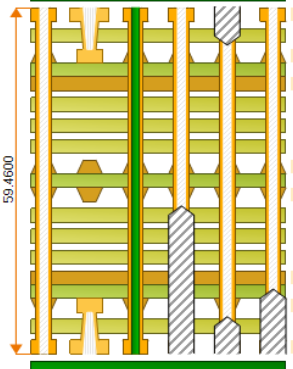


## New Back Drill type





C:\Program Files\PolarSpeedstack\Samples\Eval Imperial Back Drill Keep Vias v17.sci

Units: Mils



Layer	Stack up	Description	Processed Thickness	εr	Loss Tangent	Impedance ID
1		Liquid PhotoImageable Mask	1.000	4.000	0.0195	
		Copper Foil	0.700			1, 2
		PrePreg 1080	1.950	4.200	0.0195	
2			1.400			
		FR4 Core	3.000	4.200	0.0195	
			1.400			
		PrePreg 3080	2.776	4.200	0.0195	
		PrePreg 1651	5.552	4.200	0.0195	
3		PrePreg 1651	5.552	4.200	0.0195	
			1.400			3
		FR4 Core	12.000	4.200	0.0195	
			1.400			
		PrePreg 1651	5.552	4.200	0.0195	
		PrePreg 1651	5.552	4.200	0.0195	
		PrePreg 3080	2.776	4.200	0.0195	
4			1.400			
		FR4 Core	3.000	4.200	0.0195	
			1.400			
		PrePreg 1080	1.950	4.200	0.0195	
5		Copper Foil	0.700			4
6		Liquid PhotoImageable Mask	1.000	4.000	0.0195	

Copper Thickness = 9.800 | Dielectric Thickness = 49.660 | Solder Mask Thickness = 2.000 | Stack Up Thickness = 59.460 | Stack Up Thickness with Soldermask = 61.460

Impedance ID	Structure Image	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		1	3	0	8.500	7.500	8.115	100.000	10.000	100.350
2		1	3	0	4.500	3.500	0.000	75.000	10.000	75.870
3		4	3	6	7.250	6.250	8.500	100.000	10.000	101.280
4		8	6	0	4.500	3.500	0.000	75.000	10.000	75.870

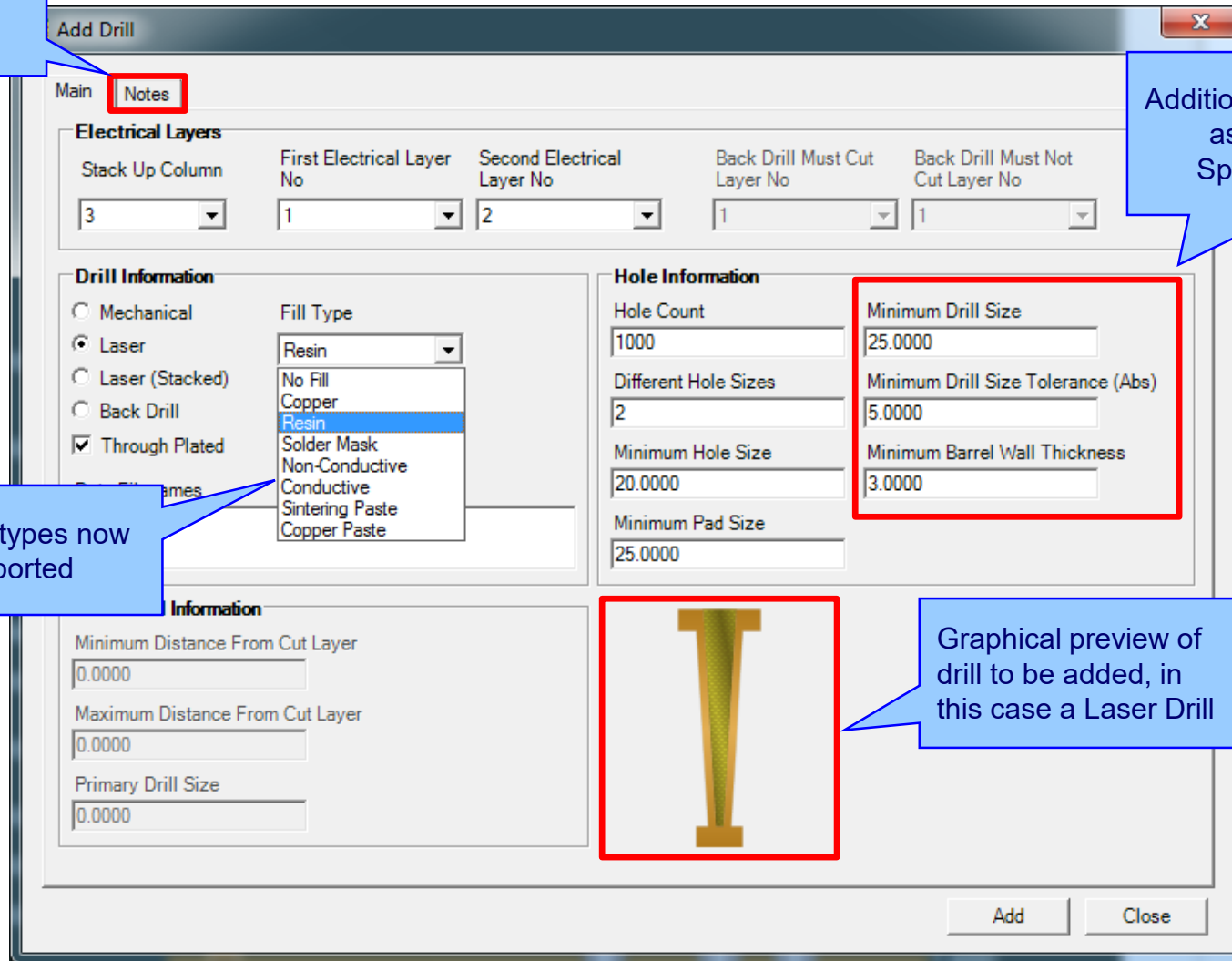
StackName: Master		Revision:		Modification:		Date of Revision:		Editor		Page 1/X
Drawing No:		Associated Documents:								
Date:										
Author:										
Department:										
Site:										

Copyright ©

Print style & presentation copyright © Polar Instruments Ltd

## Other Drill enhancements

User-definable  
Notes feature



**Add Drill**

Main **Notes**

**Electrical Layers**

Stack Up Column: 3  
First Electrical Layer No: 1  
Second Electrical Layer No: 2  
Back Drill Must Cut Layer No: 1  
Back Drill Must Not Cut Layer No: 1

**Drill Information**

☐ Mechanical  
☒ Laser  
☐ Laser (Stacked)  
☐ Back Drill  
☒ Through Plated

Fill Type: Resin  
No Fill  
Copper  
Resin  
Solder Mask  
Non-Conductive  
Conductive  
Sintering Paste  
Copper Paste

**Hole Information**

Hole Count: 1000  
Different Hole Sizes: 2  
Minimum Hole Size: 20.0000  
Minimum Pad Size: 25.0000

Minimum Drill Size: 25.0000  
Minimum Drill Size Tolerance (Abs): 5.0000  
Minimum Barrel Wall Thickness: 3.0000

**Information**

Minimum Distance From Cut Layer: 0.0000  
Maximum Distance From Cut Layer: 0.0000  
Primary Drill Size: 0.0000

Add Close

Additional drill parameters  
as requested by  
Speedstack users

Eight fill types now  
supported

Graphical preview of  
drill to be added, in  
this case a Laser Drill

## User-definable Notes fields

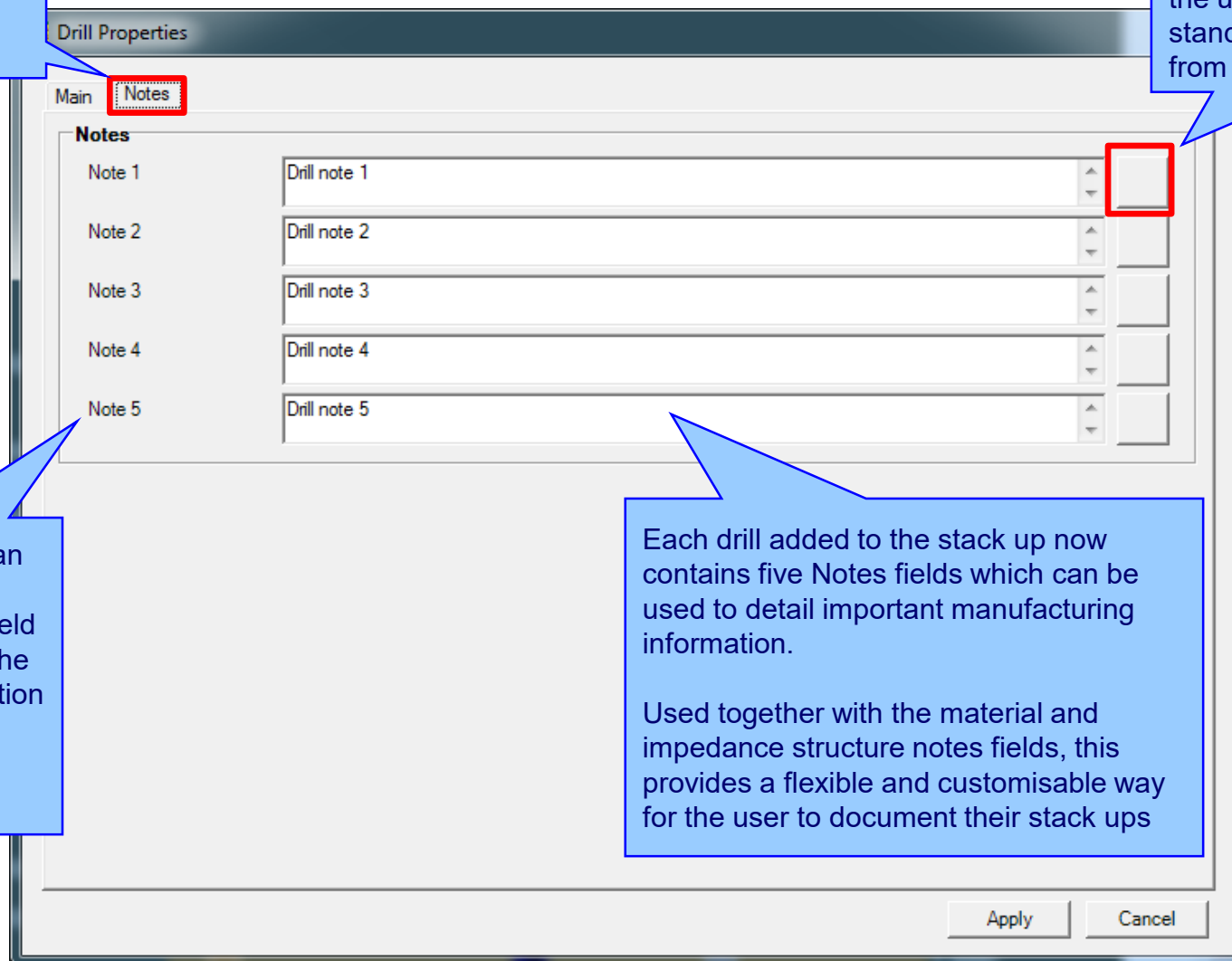
User-definable  
Notes feature

Selecting the button next to each Notes field allows the user to import a standard set of notes from a text file

The Notes fields can be used for any purpose. A Note Field Alias capability in the technical report option allows the user to customise the field name printed.

Each drill added to the stack up now contains five Notes fields which can be used to detail important manufacturing information.

Used together with the material and impedance structure notes fields, this provides a flexible and customisable way for the user to document their stack ups



The screenshot shows the 'Drill Properties' dialog box with the 'Notes' tab selected. The 'Notes' section contains five rows, each with a label (Note 1 to Note 5) and a text field. To the right of each text field is a small square button. The 'Notes' tab is highlighted with a red box. The first square button is also highlighted with a red box. At the bottom of the dialog are 'Apply' and 'Cancel' buttons.

Notes		
Note 1	Drill note 1	<input type="button" value="Import"/>
Note 2	Drill note 2	<input type="button" value="Import"/>
Note 3	Drill note 3	<input type="button" value="Import"/>
Note 4	Drill note 4	<input type="button" value="Import"/>
Note 5	Drill note 5	<input type="button" value="Import"/>

## Copper Finishing enhancements



**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.

Name	Value	Selection
Class 1	0.7000	<input checked="" type="radio"/>
Class 2	1.0000	<input type="radio"/>
Class 3	1.4000	<input type="radio"/>
Class 4	2.8000	<input type="radio"/>

Excess Resin Test

Minimum Excess Resin % 15

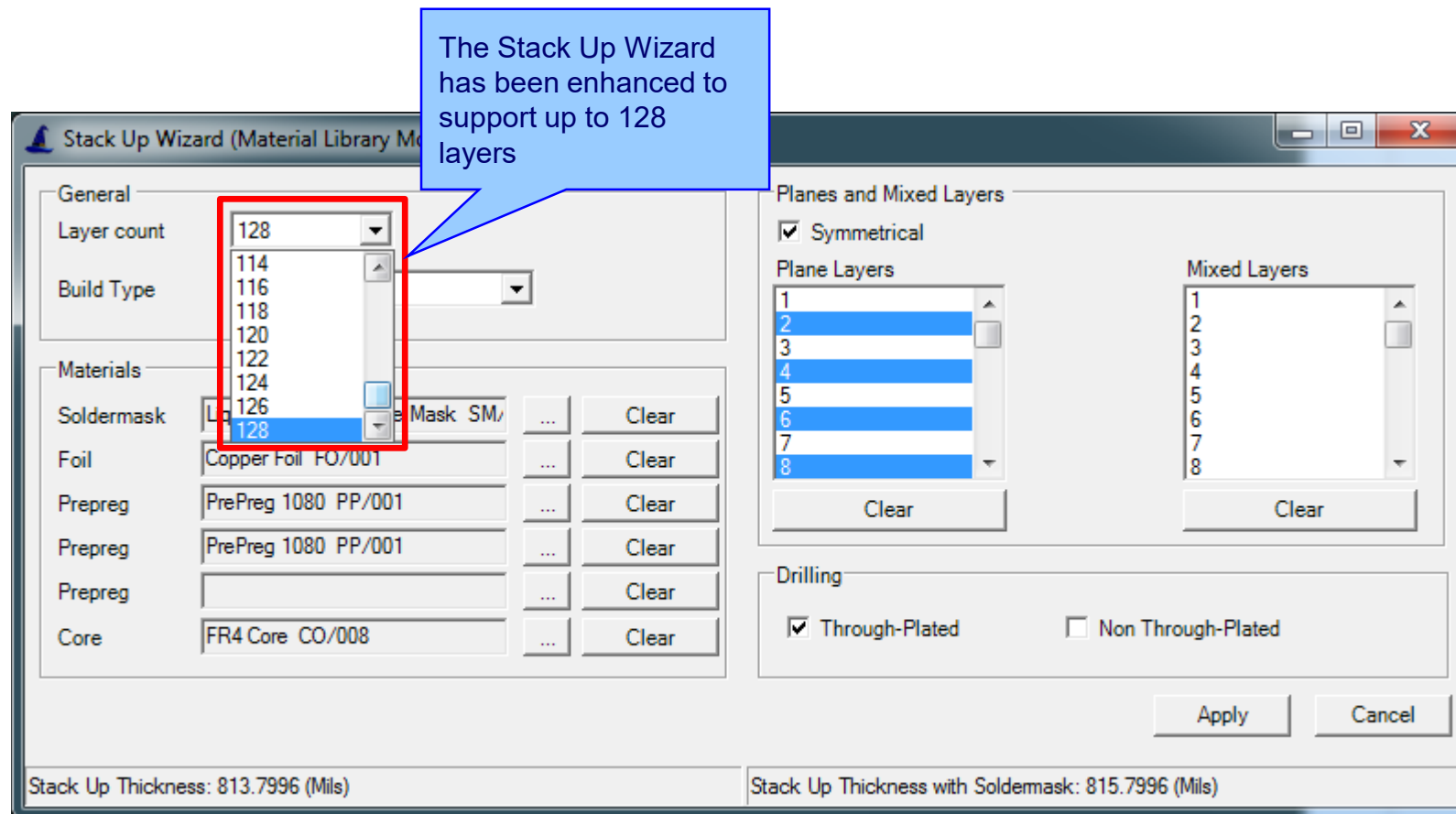
Apply Cancel

The Apply Finishing option now supports multiple user-nominated copper finishing values.

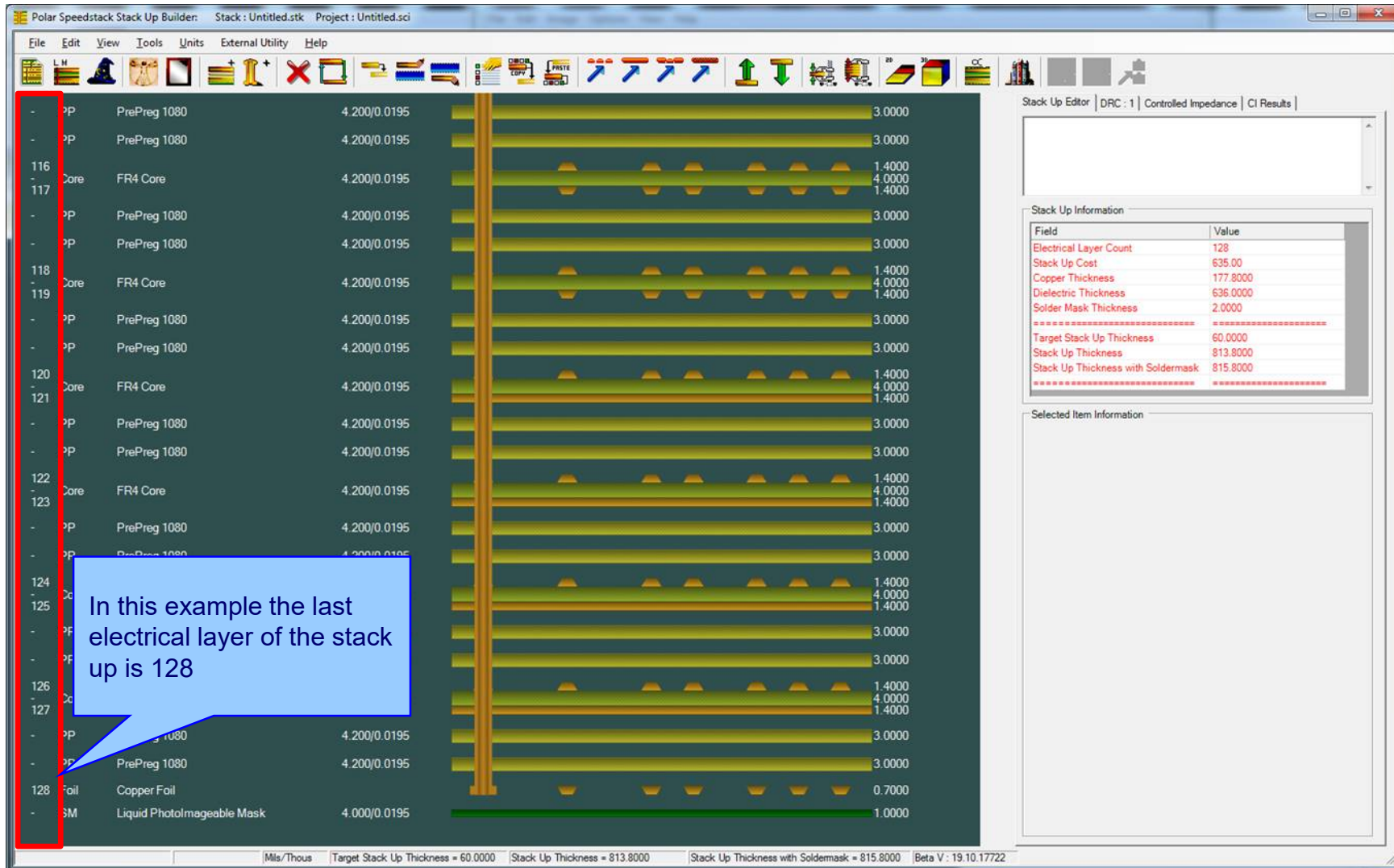
Depending upon the PCB Class selected, a different amount of copper plating is applied to the base copper



## Stack Up Wizard – now supports build up to 128 layers



# Stack Up Wizard – now supports build up to 128 layers



The screenshot displays the Polar Speedstack Stack Up Builder interface. The main window shows a list of layers on the left, a central 3D visualization of the stack up, and a right-hand panel with summary information.

**Layer List (Left Panel):**

Layer #	Material	Thickness (in)	Thickness (mm)
-	PP	PrePreg 1080	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
116	Core	FR4 Core	4.200/0.0195
117	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
118	Core	FR4 Core	4.200/0.0195
119	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
120	Core	FR4 Core	4.200/0.0195
121	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
122	Core	FR4 Core	4.200/0.0195
123	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
124	Core	FR4 Core	4.200/0.0195
125	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
126	Core	FR4 Core	4.200/0.0195
127	Core	FR4 Core	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
-	PP	PrePreg 1080	4.200/0.0195
128	Foil	Copper Foil	0.7000
-	SM	Liquid Photolamable Mask	4.000/0.0195

**Stack Up Information (Right Panel):**

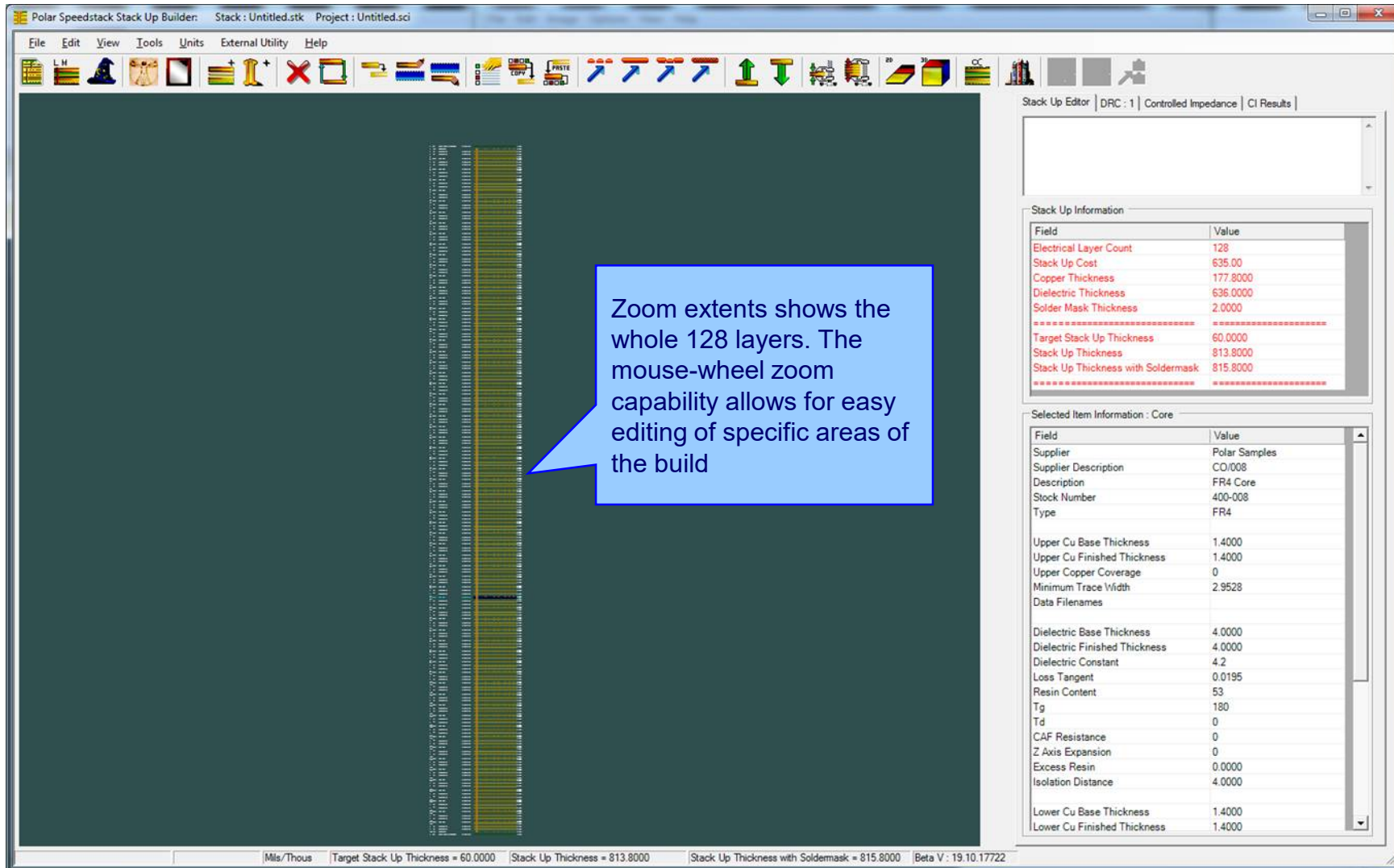
Field	Value
Electrical Layer Count	128
Stack Up Cost	635.00
Copper Thickness	177.8000
Dielectric Thickness	636.0000
Solder Mask Thickness	2.0000
Target Stack Up Thickness	60.0000
Stack Up Thickness	813.8000
Stack Up Thickness with Soldermask	815.8000

**Selected Item Information (Right Panel):**

**Bottom Status Bar:**

[Mils/Thous] Target Stack Up Thickness = 60.0000 Stack Up Thickness = 813.8000 Stack Up Thickness with Soldermask = 815.8000 Beta V : 19.10.17722

# Stack Up Wizard – now supports build up to 128 layers



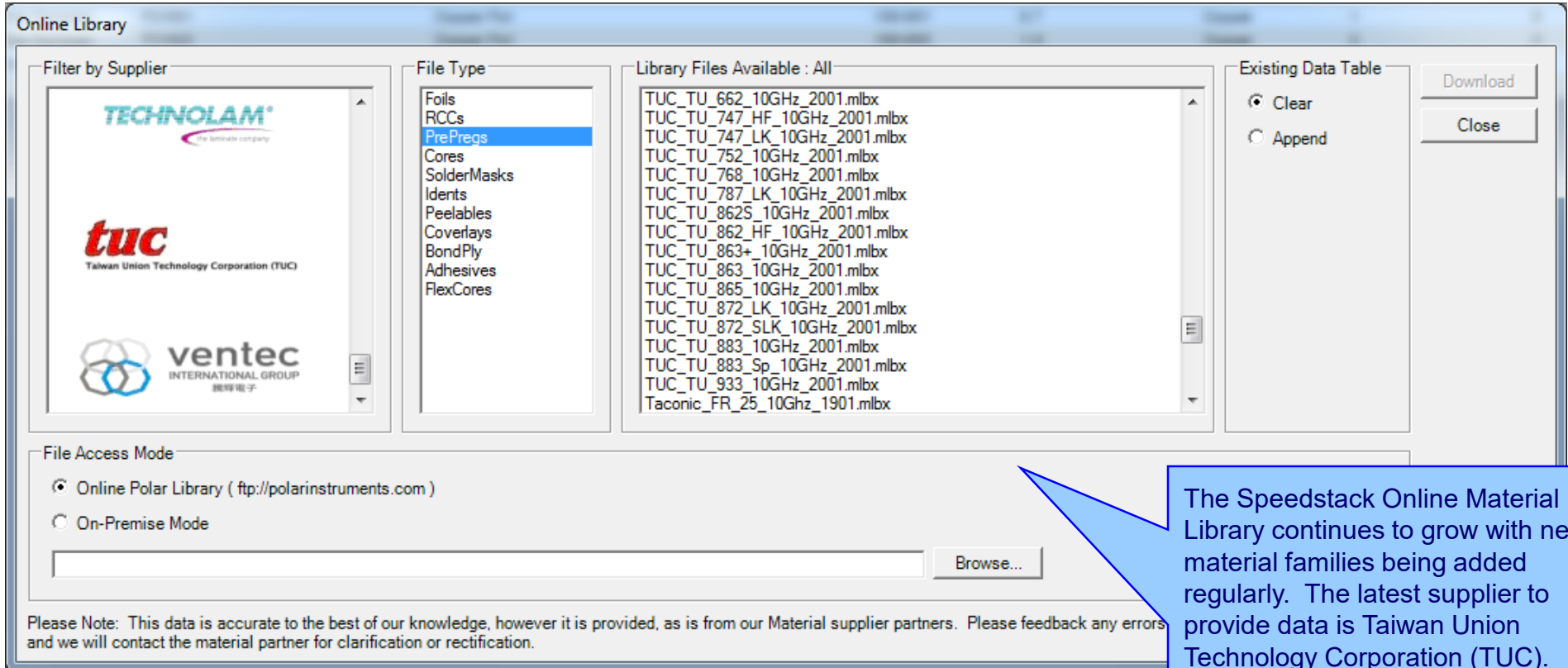
Zoom extents shows the whole 128 layers. The mouse-wheel zoom capability allows for easy editing of specific areas of the build

Field	Value
Electrical Layer Count	128
Stack Up Cost	635.00
Copper Thickness	177.8000
Dielectric Thickness	636.0000
Solder Mask Thickness	2.0000
=====	
Target Stack Up Thickness	60.0000
Stack Up Thickness	813.8000
Stack Up Thickness with Soldermask	815.8000
=====	

Field	Value
Supplier	Polar Samples
Supplier Description	COI008
Description	FR4 Core
Stock Number	400-008
Type	FR4
Upper Cu Base Thickness	1.4000
Upper Cu Finished Thickness	1.4000
Upper Copper Coverage	0
Minimum Trace Width	2.9528
Data Filenames	
Dielectric Base Thickness	4.0000
Dielectric Finished Thickness	4.0000
Dielectric Constant	4.2
Loss Tangent	0.0195
Resin Content	53
Tg	180
Td	0
CAF Resistance	0
Z Axis Expansion	0
Excess Resin	0.0000
Isolation Distance	4.0000
Lower Cu Base Thickness	1.4000
Lower Cu Finished Thickness	1.4000

Mils/Thous | Target Stack Up Thickness = 60.0000 | Stack Up Thickness = 813.8000 | Stack Up Thickness with Soldermask = 815.8000 | Beta V : 19.10.17722

## Online Material Library



The screenshot shows the 'Online Library' window with the following sections:

- Filter by Supplier:** A list of suppliers including **TECHNOLAM** (the laminator company), **tuc** (Taiwan Union Technology Corporation (TUC)), and **ventec** (INTERNATIONAL GROUP 廣輝電子).
- File Type:** A list of material types including Foils, RCCs, **PrePregs** (highlighted), Cores, SolderMasks, Idents, Peelables, Coverlays, BondPly, Adhesives, and FlexCores.
- Library Files Available : All:** A list of files including TUC\_TU\_662\_10GHz\_2001.mlbx, TUC\_TU\_747\_HF\_10GHz\_2001.mlbx, TUC\_TU\_747\_LK\_10GHz\_2001.mlbx, TUC\_TU\_752\_10GHz\_2001.mlbx, TUC\_TU\_768\_10GHz\_2001.mlbx, TUC\_TU\_787\_LK\_10GHz\_2001.mlbx, TUC\_TU\_862S\_10GHz\_2001.mlbx, TUC\_TU\_862\_HF\_10GHz\_2001.mlbx, TUC\_TU\_863+\_10GHz\_2001.mlbx, TUC\_TU\_863\_10GHz\_2001.mlbx, TUC\_TU\_865\_10GHz\_2001.mlbx, TUC\_TU\_872\_LK\_10GHz\_2001.mlbx, TUC\_TU\_872\_SLK\_10GHz\_2001.mlbx, TUC\_TU\_883\_10GHz\_2001.mlbx, TUC\_TU\_883\_Sp\_10GHz\_2001.mlbx, TUC\_TU\_933\_10GHz\_2001.mlbx, and Taconic\_FR\_25\_10Ghz\_1901.mlbx.
- Existing Data Table:** Radio buttons for **Clear** (selected) and **Append**. Buttons for **Download** and **Close**.
- File Access Mode:** Radio buttons for **Online Polar Library (ftp://polarinstruments.com)** (selected) and **On-Premise Mode**. A text input field and a **Browse...** button are also present.

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 and we will contact the material partner for clarification or rectification.

The Speedstack Online Material Library continues to grow with new material families being added regularly. The latest supplier to provide data is Taiwan Union Technology Corporation (TUC).

The material information is instantly available to all Speedstack users with an active Polarcare contract.



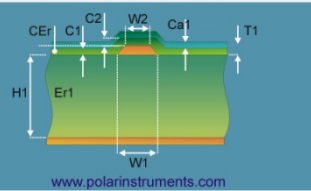
## Import / Export enhancements

The following Import / Export options have been updated to support new fields introduced with Speedstack 2020:

- XML STKX v17.00 and SSX v7.00 import / export options
- CSV export option

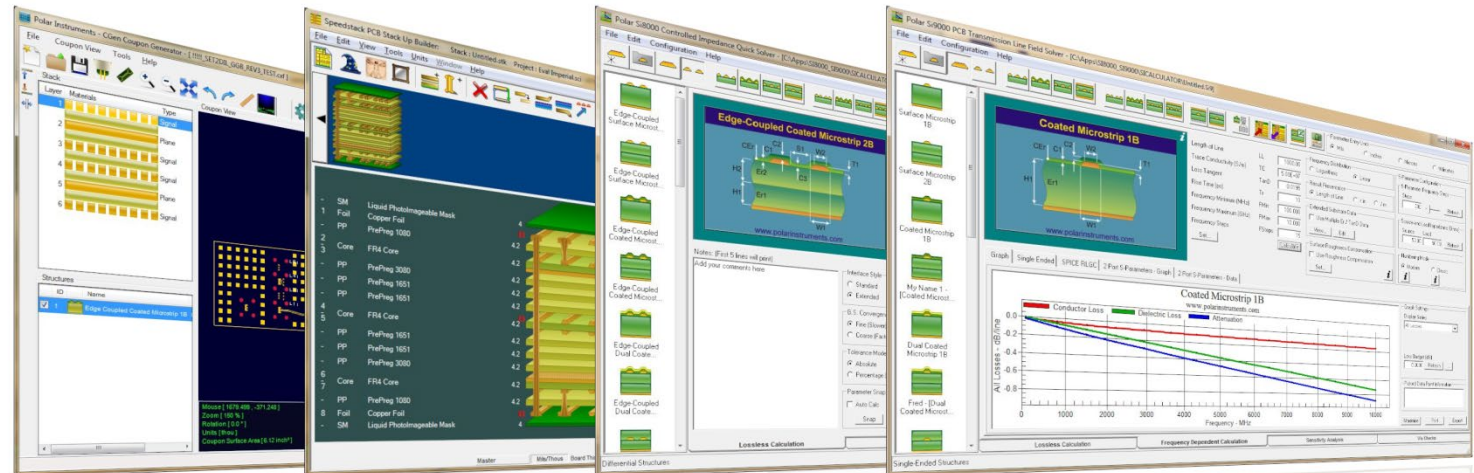
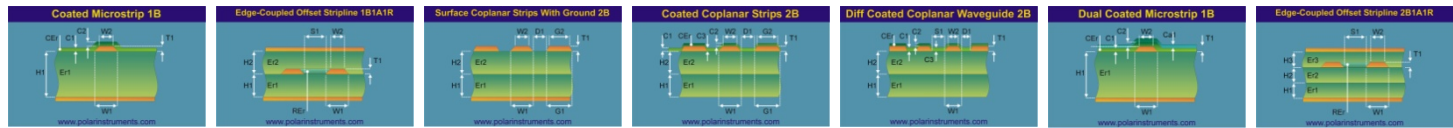


Impedance calculation



www.polarinstruments.com

*Thank you for viewing this Speedstack 2020 release presentation. If you have questions we would be delighted to help you. Your local contact information is contained on the following slide*

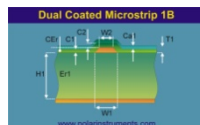
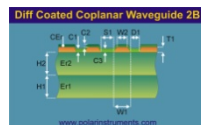
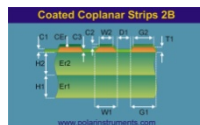
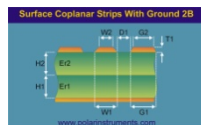
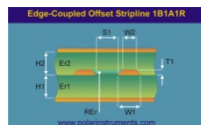
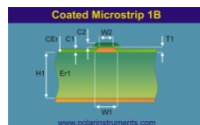
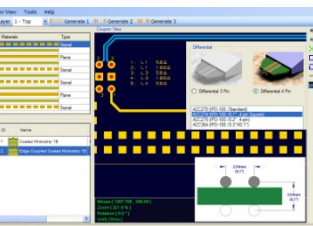
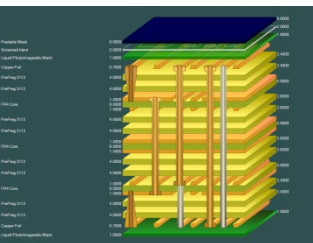
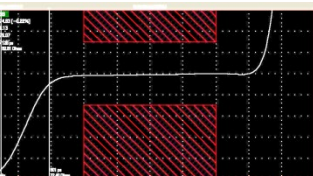
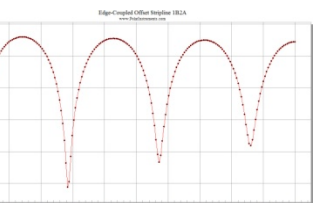
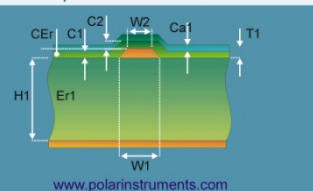


Polar Logo & graphic devices are registered trade marks of Polar Instruments Ltd.  
Copyright Polar Instruments Ltd (c) 2020

[polarinstruments.com](http://polarinstruments.com)



#### Impedance calculation



**For more information:  
Contact Polar now:**

**USA / Canada / Mexico  
[Geoffrey Hazelett](mailto:Geoffrey.Hazelett@polarinstruments.com)**

**Asia / Pacific  
[Terence Chew](mailto:Terence.Chew@polarinstruments.com)**

**UK / Europe  
[Neil Chamberlain](mailto:Neil.Chamberlain@polarinstruments.com)**

**Germany / Austria / Switzerland  
[Hermann Reischer](mailto:Hermann.Reischer@polarinstruments.com)**

**[www.polarinstruments.com](http://www.polarinstruments.com)**

**Phone**

**(503) 356 5270**

**+65 6873 7470**

**+44 23 9226 9113**

**+43 7666 20041-0**

Polar Logo & graphic devices are registered trade marks of Polar Instruments Ltd.  
Copyright Polar Instruments Ltd (c) 2020

**[polarinstruments.com](http://polarinstruments.com)**