











Speedstack 2019 Introduction

Richard Attrill / John Lee – Dec 2018 (Rev 2)





Introducing Speedstack 2019

Welcome to a preview of Speedstack 2019.

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.



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Foils Prepregs RCCs Cores Solder Masks Ident Inks Peelable Masks Coverlays Bond Ply Adhesive Flexi	ible Cores				
Supplier Supplier Description Description	Stock Number	Dielectric Base 1	Thickness Dielectric Finish	ed Thickne Dielectric Constant	Loss Tangent
Polar Samples PP/001 PrePreg 1080	300-001	3	3	4	0.0191
Polar Samples PP/002 PrePreg 3080	300-002	3	3	4.05	0.0192
Polar Samples PP/003 PrePreg 1651	300-003	6	-	4.1	0.0194
Polar Samples PP/005 PrePreg 7628	300-005	7.9	7.9	4.2	0.0195
Polar Samples PP/006 PrePreg 106	300-005	2	2	4.25	0.0196
*					
			A new L has bee material Core, R Mask, F Bondply Coverlay	oss Tangent field n added to eight s within the libra CC, Prepreg, So lexible Core, , Adhesive and	d ry: ilder

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Review/Edit Prepregs				
Supplier	Polar Samples	Size	•	
Supplier Description	PP/004	Note 1		
Description	PrePreg 1651			
Stock Number	300-004			
Туре	Dielectric	I		
		Note 2		
Base Thickness	6.0000			
Finished Thickness	6.0000			
Dielectric Constant	4.15	Note 3		
Loss Tangent	0.0194			
Resin Content	47			
Tg	180			
Td	0	The Loss Tangent field	d is an	
CAF Resistance	0	important dielectric ma	aterial	
Z Axis Expansion	0	property that is used w	vhen	
Excess Resin	0.0000	calculating frequency	dependent	
Tolerance +/-	10	insertion loss		
Cost	4			
Lead Time	0			
Laser Drillable				
Use in Auto Stack				
Next To Foils				
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	Polar Samples	PrePreg 1080			3	3	4	0.0191		
	PolarSamples	PrePreg 3080			3	3	4.05	0.0192		
	Polar Samples	PrePreg 3113 PrePreg 1651			4	4	4.1	0.0193		
ŕ	PolarSamples	PrePreg 7628			7.9	7.9	4.2	0.0195		
	Polar Samples	PrePreg 106			2	2	4.25	0.0196		
*										
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2 * 3 *Type Su 4 Dielectric Po 5 Dielectric Po 6 Dielectric Po 7 Dielectric Po 8 Dielectric Po 9 Dielectric Po 10 11 12 13 14 15	upplier olar Samples olar Samples olar Samples olar Samples olar Samples	Supplier Description PP/001 PP/002 PP/003 PP/004 PP/005 PP/006	Description PrePreg 1080 PrePreg 3080 PrePreg 3113 PrePreg 1651 PrePreg 7628 PrePreg 106	Stock Number 300-001 300-002 300-003 300-004 300-005 300-006 e Materia tions have	Dielectric Base Thickness 3 4 6 7.9 2 1 Library ir e been ext	Dielectric Finished Thickness 3 4 6 7.9 2 mport / expo	Dielectric Dielectric Constan 4.04.04.04.04.04.04.04.000000000000000	Dielectric Loss Tangent Loss Tangent Dielectric Dielect	Dielectric Resin Content 60 60 53 47 45 60	Dielectric Tg 180 180 180 180 180 180	Dielectric Td 0 0 0 0 0 0 0	Dielectric CAF Resistance 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
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Description column width has been increased

Foils	Prepregs RCCs	Cores Solder Masks Ident Inks Per	elable Masks Coverlays Bond Ply Adhesive Flexible Cores		1		1		-1	
	Supplier	Supplier Description	Description	Stock Number	Dielectric Base Thickness	Dielectric Finished Thickne	Dielectric Constant	Loss Tangent	_	
•	INSULECTRO	8H025XXY240180	FR185HR_0.0025_H_RTF_H_RTF_1-1080_18G_X_24	120-000001-001	2.5	2.5	3.96	0		
	"TCT CIRCUIT SUPP	TU-865	TU-865_0.0020_H_RTF_H_RTF_1-106_18G_X_24	120-000001-004	2	2	3.9	0		
	"PHOTO CHEMICAL	S1000-2	"S1000-2 0.0590_1_HTE_1_HTE_8-7628_21G_X_24"	120-000001-195	0.06	0.06	4.49	0		
	"ROGERS CORPOR	"RT/duroid 6002NS"	"RT/duroid 6002NS 0.0100_5R/5R_NG_18X24"	120-000001-196	10	10	2.94	0		
	INSULECTRO	FR185HR	FR185HR_0.0025_H_RTF_1_RTF_1-1080_18G_X_24	120-000002-001	2.5	2.5	3.96	0		
	"TCT CIRCUIT SUPP	TU-865	TU-865_0.0020_H_RTF_1_RTF_1-106_18G_X_24	120-000002-004	2	2	3.9	0		
	Mitsubishi	"CCL-HL832NS (E-glass)"	CCL-HL832NS_0.0079_H_RTF_H_RTF_2-2116_18G_X_24_P	120-000002-007	7.9	7.9	4.4	0		
	ROGERS CORPOR	RO3003	"RO3003.0050_HH/HH_NG_24X18"	120-000002-196	5	5	3	0		



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Online Library – Now supports libraries contain Loss Tangent data



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Online Library – On-Premise Mode has been enhanced











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- 1 - 2 - 3	SM Foil PP Core	Liquid PhotoImageable Mask Copper Foil PrePreg 1080 FR4 Core	 4.000/0.0200 4.000/0.0191 4.200/0.0195 	I		-	1.0000 1.4000 1.9500 1.4000 3.0000 1.4000 1.4000	Properties
Pre	Main No Main No Gener Supp Desc Stoc Type	otes Attributes Attrib	Polar Samples PP/001 PrePreg 1080 300-001 Dielectric		Cost Tolerance Lead Time	1.00 10.00 0.00	Apply Close Opening the materia allows for the Loss T viewed / changed	Il Properties dialog āngent value to be
	Base Finis Diele Loss Resi Tg	e Thickness shed Thickness ectric Constant s Tangent in Content %	3.0000 3.0000 4.0000 0.0191 60.00 180.0	Td CAF Resistance Z Axis Expansion Excess Resin Isolation Distance Graphical Colour		0.0 0.0 0.0 0.0000 1.9500		





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Frequency Dependent Calculation Enhancements (Speedstack Si)

Stack Up Editor DRC : 0 Controlled Imper	dance CI Results
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Substrate 2 Dielectric	Fr2 4 0000
Lower Trace Width	W1 8 5000
Loner Trace Width	W2 7 5000
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 97.04
Target Impedance	100.00
Target Tolerance %	10.00

In order to accurately calculate frequency dependent loss it is necessary to know the critical information regarding the transmission line structure.

Speedstack 2019 will now use the dielectric constant <u>and</u> loss tangent data from the stack up

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<u>Speedstack – Material and Surface Roughness properties</u>

Substra	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	1.000E+09	4.0000	0.0191					
H3								
H4								
REr								
CEr	1.000E+09	4.0000	0.0200					
	\sim							

In order to accurately calculate Dielectric Loss it is important to understand the material / substrate properties.

These substrate properties including dielectric constant (Er) and loss tangent (TanD) are specified here for each structure substrate region.

Speedstack causally extrapolates Er and TanD over the specified frequency range using the Svensson-Djordjevic method, hence the ability to specify the extrapolation reference points for each substrate region. The reference point data is usually available from the material supplier data sheet and can be added to the Speedstack material library. The checkbox options will automatically populate these fields from the stack up materials.

Surface Roughness Co	mpensation	
C Smooth		
C Hammerstad	7	Edit
O Groisse		
Huray		Edit



To accurately calculate Conductor Loss it is necessary to specify the surface roughness parameters.

Speedstack supports multiple roughness models: Hammerstad, Groisse, Huray and Cannonball-Huray. In this example the Huray method is used, the dialog prompts for the required roughness parameters.



Virtual Material Mode enhancements

Stack Up Wizard (Virtual Material	Mode)		
Number of Layers Target Stack Up Thickness	8 -	Nominal Dielectric Constant Nominal Loss Tangent	4.2000
Positive Tolerance % Negative Tolerance %	10 10	Solder Mask Top Solder Mask Bottom Solder Mask Dielectric Constant	I⊽ 4.0000
S <u>v</u> mmetrical		Solder Mask Loss Tangent	0.0210
Plane Layers 1 2 3 4 5 6 7	Mixed Layers 1 2 3 4 5 6 7	Solder Mask Thickness Preferred Core Thickness Copper Thickness Build Type	1.0000 6.0000 1.0000
<previous next=""></previous>	8	○ Foil ○ Core ○ Seguen	tial/h Virtual Material Mode allow quick generation of stack u the need to populate the m library. It is great for 'what

Speedstack 2019 introduces material and solder mask loss tangent parameter entries to the wizard.

scenarios.





Virtual Material Mode enhancements



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Printing Enhancements – Support for Loss Tangent

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C:	Program	n Files∖Polar\Speedstack\Samples∖Eval Imperial v:	16.sci L	Jnits: Mils						Dolar
						Breesed				
L	ayer	Stack up	Supplier	Туре	Description	Thickness	٤r	Loss Tangent	Impedance ID	
			Polar Samples	SolderMask	Liquid Photolmageable Mask	1.000	4.000	0.0200		
1			Polar Samples	Copper	Copper Foil	1.400			1, 2	
			Polar Samples	Dielectric	PrePreg 1080	1.950	4.000	0.0191		
2			Polar Samples	FR4	FR4 Core	1.400 3.000	4.200	0.0195		
3						1.400				
			Polar Samples	Dielectric	PrePreg 3080	2.776	4.200	0.0195		Loss Tangent is a
			Polar Samples	Dielectric	PrePreg 1651	5.552	4.200	0.0195		selectable column
4	9		, our compress	0.010.0110		1.400			3	
5			Polar Samples	FR4	FR4 Core	12.000	4.200	0.0195		within the print option
			Polar Samples	Dielectric	PrePreg 1651	5.552	4.200	0.0195		
			Polar Samples	Dielectric	PrePreg 1651	5.552	4.200	0.0195		
			Polar Samples	Dielectric	PrePreg 3080	2.776	4.200	0.0195		
6			Polar Samples	FR4	FR4 Core	1.400 3.000 1.400	4.200	0.0195		
			Polar Samples	Dielectric	PrePreg 1080	1.950	4.200	0.0195		
			Polar Samples	Copper	Copper Foil	1.400			4	
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Speedstack 2019 allows comprehensive bidirectional copy and paste from Speedstack into Si9000e including all relevant loss tangent, roughness and roughness method parameters along with frequencies of interest.



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Drill / Via Fill Types – Four new types added

📲 Add Drill		×
Column	First Electrical Layer No	Second Electrical Layer No 2
Drill Information	Fill Type	Hole Information Hole Count
C Laser	No Fill	
Through Plated	Copper Resin Solder Mask	0
Data Filenames	Non-Conductive Conductive Sintering Paste	Minimum Hole Size
Four new fill types	are now	Add Close
supported: 1. Non-Conductive 2. Conductive 3. Sintering Paste 4. Copper Paste	•	



Drill / Via Fill Types – Four new types added





Drill / Via Fill Types – Four new types added







The following Import / Export options have been updated to support new fields introduced with Speedstack 2019:

- XML STKX v16.00 and SSX v6.00 import / export options
- IPC-2581 Rev B import / export options
- CSV export option
- Gerber export option
- DXF export option

Impedance and Insertion Loss Calculations:

- New amalgamation algorithm now amalgamates multiple substrates to a single substrate for both dielectric constant and loss tangent
- Modifications implemented to support causal surface roughness

Rigid-Flex Improvements. When introducing air gaps into a sub-stack that previously had contiguous materials it is now possible to reassign this sub-stack to one that contains mini-stacks, by using the 'Reset Mini-Stack Settings' option from the Navigator menu. This is especially useful when designing 'book-binder' or 'doublet' rigid-flex constructions

Ucamco Interface. The File menu 'Save and Continue' and 'Save and Quit' options now support the SSX v6.00 file format

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Impedance calculation

CEr







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Coated Microstrip 1B	Edge-Coupled Offset Stripline 1B1A1R	Surface Coplanar Strips With Ground 2B	Coated Coplanar Strips 2B	Diff Coated Coplanar Waveguide 2B	Dual Coated Microstrip 1B	Edge-Coupled Offset Stripline 2B1A1F
			D1 CE7 C2 22 W2 D1 C2 T1 H2 E2 H1 E1 T1 W1 01			11 12 14 15 15 17 17 17 17 17 17 17 17 17 17 17 17 17

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