

# **PCB West Conference & Exhibition 2021**

Santa Clara, California, USA  
5-8 October 2021

Volume 1 of 3

ISBN: 978-1-7138-5549-1

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2021) by Printed Circuit Engineering Association (PCEA)  
All rights reserved.

Printed with permission by Curran Associates, Inc. (2022)

For permission requests, please contact Printed Circuit Engineering Association (PCEA)  
at the address below.

Printed Circuit Engineering Association (PCEA)  
PO Box 807  
Amesbury, Massachusetts  
USA 01913

Phone: (617) 327-4702

<https://pcea.net/>

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2633  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# TABLE OF CONTENTS

## VOLUME 1

Effective Printed Circuit Board Design: Techniques to Improve Performance.....	1
<i>Daniel Beeker</i>	
Electromagnetic Fields for Normal Folks - Show Me the Pictures and Hold the Equations, Please!.....	80
<i>Daniel Beeker</i>	
Feeding the Beast: Consumption-Based PCB Design .....	116
<i>Daniel Beeker</i>	
PCB Design Techniques to Improve ESD Robustness.....	173
<i>Daniel Beeker</i>	
An Intuitive Approach to Understanding High Speed Layout (The Basics From Another Perspective) .....	216
<i>Keven Coates</i>	
Heat Management for SMD, LED, and Systems in 1W - 50W Sections (Do Not Let The Smoke Out!) .....	256
<i>Keven Coates</i>	
Advanced Process Engineering Defects .....	305
<i>Paul Cooke</i>	
Advancements in Prepreg Enabling New Applications for Millimeter-Wave (mmWave) and High Speed Digital (HSD).....	496
<i>John Coonrod</i>	
Printed Circuit Board Fabrication.....	514
<i>Paul Cooke</i>	

## VOLUME 2

DFM - A Foundation for Cost Reduction.....	631
<i>Gary Ferrari</i>	
The 21 Most Common Design Errors, Caught by Fabrication (And How To Prevent Them) .....	755
<i>Ray Fugitt, Dave Hoover</i>	
Design and Analysis of a High-Performance PCB Interposer for 100G PAM4 Validation .....	791
<i>Xiao-Ming Gao</i>	
Circuit Grounding to Control Noise and EMI .....	809
<i>Rick Hartley</i>	
Differential Pair Routing for Signal Integrity and EMI Control.....	866
<i>Rick Hartley</i>	
PC Board Design and Layout to Optimize DFM.....	899
<i>Rick Hartley</i>	

PC Board Layout of Switch Mode Power Supplies.....	939
<i>Rick Hartley</i>	
PCB Design for Power Distribution and Decoupling .....	976
<i>Rick Hartley</i>	
RF and Mixed Signal PC Board Design and Layout .....	1024
<i>Rick Hartley</i>	
Routing and Termination to Control Signal Integrity.....	1085
<i>Rick Hartley</i>	
Signal Attenuation in Very High Speed PC Boards .....	1121
<i>Rick Hartley</i>	
Secure Data Exchange Between Design and Manufacturing .....	1163
<i>Michael Ford, Hemant Shah, Ivan Aduna</i>	
PCB Antennas 101 .....	1179
<i>Ben Jordan</i>	

### VOLUME 3

Ask the Flexperts.....	1216
<i>Nick Koop, Mark Finstad</i>	
PCB Design Optimization: What it Means and New Methods.....	1315
<i>Zachariah Peterson</i>	
Getting to 56 Gb/s - A Tutorial on Very High-Speed Differential Signaling.....	1337
<i>Lee Ritchey</i>	
PCB Stackup Design for Foil, CAP, Build UP and Mass Lamination .....	1440
<i>Lee Ritchey</i>	
Power Delivery System Design.....	1523
<i>Glen Ellen, Lee Ritchey</i>	
IPC-2581's Bi-Directional Electronically Executable DFM Exchange Accelerates NPI .....	1613
<i>Shah Hemant, Terry Hoffman, Dana Korf, Ed Acheson</i>	
Future-Proof Your Designs with a Flexible-Footprint .....	1638
<i>Shane Shuffield</i>	
Flexible and Rigid Flex Circuit Design Principles .....	1648
<i>Vern Solberg</i>	
PCB Design for Implementing 3DD and High Density Semiconductor Package Technologies.....	1760
<i>Vern Solberg</i>	

### Author Index