Dr. Eric Bogatin

(cell) 913-424-4333
4900 Thunderbird Dr #643
Boulder, CO 80303 Eric.Bogatin@colorado.edu
CU faculty web site: https://www.colorado.edu/faculty/bogatin/

Research Interests: Signal integrity, EMI and interconnect design, high frequency measurement and simulation tools and technology, microelectronics packaging and interconnect technologies; contact resistance, failure analysis, surface analysis and materials analysis; analog electronics; MEMs technology and sensor technology.

Education:

Ph.D. in Physics, 1980, University of Arizona, Tucson. Dissertation title: "Three New high Precision Tests of Special Relativity and Mach's Principle"
M.S. in Physics, 1978, University of Arizona, Tucson
B.S. in Physics, 1976, M.I.T., Cambridge, Mass.

Experience:

University of Colorado, Boulder, ECEE, (2012-present) Teaching Professor, Scholar – in – Residence,
Capstone Senior Design Lab, Printed Circuit Board Design and Manufacturing, High Speed Digital Design, Advanced PCB Design, Circuits1 + Labs, Circuits 2

Signal Integrity Journal, (2015-present) Technical Editor
Co-founder, editorial advisory board member and contributing editor for the leading industry publication on signal integrity, power integrity and EMC.

Teledyne LeCroy, (2021-present) Fellow
Brand manager and signal evangelist,

Bogatin Enterprises, a division of Teledyne LeCroy, Longmont, CO (Jan 1988 to 2021) (Acquired July 2011 by Teledyne LeCroy) **President and Co-Founder**
Created a new signal integrity training and education business based on presenting live public classes, onsite classes and online lectures streamed over the web. Clients include top electronics companies such as Intel, Motorola, TI, Agilent, nVidia, HP, National Semiconductor, Dell and Cisco.

(retired as):

Interconnect Devices Inc, Kansas City, KS, (Jan 2004 to July 2006): Chief Technology Officer
Developed a corporate product and technology roadmap, developed and implemented a research program to control contact resistance in specialized connectors, lead the technical problem-solving teams to meet numerous customers' requirements, positioned company as world leader in high bandwidth interconnects in the industry and with strategic accounts.

Ansoft Corp, (Nov 96- Nov 98): Product Manager, Signal Integrity Products
Led the product marketing for all signal integrity related software tools

Silicon Light Machines (acquired by Cypress Semiconductor) (June 1995 to Nov 1996): Manager and Principal Engineer, Packaging Technology.
Created and led the packaging team for a new MEMs based optical device based on diffracting ribbons. Developed and implemented a new packaging technology for an optical MEMs device.

Sun Microsystems (Nov 1992 to June 1995): Manager, World Wide Operations Ball Grid Array Technology Implementation, Processor Modules, and New Technologies Group.
Lead multiple, worldwide teams to introduce new packaging and interconnect technologies into Sun product families, including MCMs and BGAs. Directed cross disciplinary projects with product groups, manufacturing, R&D teams and vendors.

Xinix Inc. (acquired by Luxtron) (May 1989 to May 1990): VP of R&D and Chief Technology Officer.
Lead the new product development effort for a small company which manufactured instruments for real time, in situ monitor and control of IC manufacturing processes.

Raychem Corp (acquired by Tyco Electronics) (July 1984 to May 1989): Director, Systems Engineering and Product Marketing.
Managed multiple R&D teams and projects on high performance interconnect products. Responsible for groups doing strategic marketing, technical marketing, product development and test engineering for new interconnect and MCM technologies.

AT&T Bell Lab (1980 to July 1984); Senior Member of the Research Staff;
Created and implemented the manufacturing technology for a major component of a new interactive display device. Created sensors for the in-situ monitor and control of PCB manufacturing processes.

Other teaching experience:

2016, **Spring Front Range Community College**, Longmont, CO, Instructor, 1-semester Physics-1 course

May 1990 to Nov 1992: **San Jose State University**, Center for Microelectronics and Materials Research, Adjunct Associate Professor, Taught graduate classes on signal integrity and interconnect design and conducted research and consulting on interconnect design.

1988-1995, UC Extension programs: **UC Berkeley, UC Santa Cruz, UCLA** Invited signal integrity, short course instructor on signal integrity topics, lasting from a 3-day intensive course to a semester-long course

1978-1980, **Pima Junior College**, Tucson, AZ Instructor, Teaching first and second-semester pre-calculus physics

1976, Summer, **Worchester Junior College**, Worchester, MA, Instructor, teaching third-semester physics: Vibrations and waves with intro to quantum mechanics

Awards and Recognition:

- 2021 Holland Teaching Award, ECEE Department, CU Boulder
- (2018-present) Invited Keynote speaker at Altium Live
- 2016 Engineer of the year award, DesignCon
- Distinguished Lecturer with IEEE EMC Society, 2009- 2013
- (2018-present) Invited instructor, EMC Society Symposium Global University

Patents:

- 10 patents

Service:

- MIT education councilor, 1983-present
- Co-chair of the Global SI/EMC University for the IEEE EMC Society World Wide Symposium, 2012- 2015
- Presented > 100 industry webinars on best measurement practices with scopes and VNAs.
- Chair of task force 2 in the IEEE P370 specifications committee, resulting in the release of the IEEE 370-2020 - IEEE Standard for Electrical Characterization of Printed Circuit Board and Related Interconnects at Frequencies up to 50 GHz
- Contributing editor for Nuts and Volts Magazine, 2010-2020
- Monthly columnist for four magazines with over 200,000 total circulation (1995-2010)
- Chair of the Lab committee, CU, Boulder ECEE 2022
- Co-chair of the Lab committee, CU, Boulder ECEE 2023
- Member of the CEAS HOLISTIC committee CU, Boulder, 2023

Publications: Books

Bogatin, E, Bogatin's Practical Guide to Breadboard and Printed Circuit Board Prototype Design with an Introduction to Signal Integrity, Artech, to be published in fall, 2021

Bogatin, E, Bogatin's Practical Guide to Design and Characterization of Transmission Lines for Signal Integrity, Artech, 2020

Bogatin, E., Signal and Power Integrity- Simplified, 3rd edition, Prentice Hall, 2018, translated into three languages.

Smith, Larry and Bogatin, Eric, Principles of PDN Design-Simplified, Prentice Hall, 2017

Bogatin, Eric, S is for Space, Addie Rose Press, 2019 (a science fiction novel)

Bogatin, Eric, Shadow Engineer, Addie Rose Press, 2016 (a science fiction novel)

Bogatin, Eric, Science Experiments with Arduinos, Addie Rose Press, 2019

Bogatin, Eric, Arduinos without Tears, Addie Rose Press, 2018

Resso, M., and Bogatin, E., Signal Integrity Characterization Techniques," Addie Rose Press, 2009

Bogatin, E., Signal Integrity- Simplified, 1st edition, Prentice Hall, 2008.

Bogatin, E, Packaging Technology Update, ICE, 2000

Bogatin, E., Roadmaps for Advanced Packaging Technology, ICE, 1998

Bogatin, E., High-Performance Packaging Technologies, ICE, 1996

Publications: from Google Scholar, since 2021

Analysis of a TDR Technique to Measure Dielectric Constant
A Rao, E Bogatin, M Piket-May… - … & Signal/Power …, 2022 - ieeexplore.ieee.org
Low cost measurement of material properties is a valuable tool which can aid in pre-layout design and post-layout verification. This paper analyzes a low-cost technique to measure the …
SaveCiteCited by 1Related articles
[PDF] ieee.org

What's New in Signal Integrity and High-Speed Serial Links: Approaching the Fundamental Limits of Copper Interconnects
E Bogatin - IEEE Microwave Magazine, 2022 - ieeexplore.ieee.org
In high-speed digital systems containing dense digital devices, such as microcontrollers, microprocessors, graphic processors, network processors, switching hubs, field-programmable …
SaveCiteCited by 1Related articles

[Non-destructive PCB Substrate Height Extraction with Multi-Measurement Technique]
TW Lee, F de Paulis, M Resso… - 2021 IEEE 25th …, 2021 - ieeexplore.ieee.org
This paper introduces a non-destructive measurement technique that extracts the as-fabricated substrate height of printed circuit boards. The as-fabricated substrate height is a crucial …
SaveCiteCited by 1Related articles
[PDF] ieee.org

[S-Parameters for High-Speed Digital Engineers: A Beginner's Guide]
E Bogatin - IEEE Electromagnetic Compatibility Magazine, 2023 - ieeexplore.ieee.org
Scattering or S-parameters, have been used in RF applications for more than 70 years [1]. However, it has only been in the last 30 years they have been used extensively in high-speed …
SaveCiteRelated articles
[PDF] ieee.org

[Novel low cost launch for measuring via-to-cavity coupling]
F Deek, M Piket-May, E Bogatin - 2021 IEEE Electrical Design …, 2021 - ieeexplore.ieee.org
In order to isolate the effect of coupling between a signal via and a PCB or package cavity a novel launch setup is described and analyzed. This low cost launch consists of using a 0.35…
SaveCiteCited by 1Related articles
[PDF] ieee.org

[Impact of Copper Pour on Crosstalk: Measurement and Simulation Correlation]
A Rao, S Sawant, E Bogatin… - 2021 IEEE 30th …, 2021 - ieeexplore.ieee.org
Impact of Copper Pour on Crosstalk: Measurement and Simulation Correlation Page 1 Impact of Copper Pour on Crosstalk: Measurement and Simulation Correlation Aditya Rao1, Saish …
SaveCiteRelated articles

Other Publications:

Smith, L., Bogatin, E., “Principles of Power Integrity for PDN Design”, 2018 IEEE Symposium on EMC/SI/PI.

Deek, F., Piket-May, M., Bogatin, E., “Transfer Impedance Drop off in Power/Ground Plane Cavities”, 2018 IEEE Symposium on EMC/SI/PI

Barnes, H., Bogatin, E., Moreira, J., “Development of a PCB kit for s-parameter de-embedding algorithms verification” in 2017 IEEE Int’l Symposium on EMC/SI/PI

Bogatin, E., et. al, “New Characterization Technique for Glass Weave Skew-part 2”, DesignCon 2017.

Bogatin, E., Shlepnev, Yuriy, Wang Lee, Tim, “Back to Basics: the onset of skin depth effect in circuit board traces”, DesignCon 2017. Best paper award

Bogatin, E., et. al., “New Characterization Technique for Glass Weave Skew-part 1”, DesignCon 2016. Best paper award

Duffy, AP., Shang. G., Luk., Bogatin, E., Huang, CC, “Assessing techniques to compare signal integrity data for high-speed interconnects”, 2016, IEEE Symposium on EMC

Resso,. M., Bogatin, E., Vatsyayan, A., “A new method to verify the accuracy of de-embedding algorithms”, 2016 IEEE MTT-S Latin America Microwave Conf, 2016

Bogatin, E., Simonovich, L., “Dramatic Noise Reduction using Guard Traces with Optimized Shorting Vias", DesignCon, 2013, best paper award

Bogatin, E., DeGroot, D., Huray, P., Shlepnev, Y., “Which one is better? Comparing Options to Describe Frequency Dependent Losses”, DesignCon 2013

Bell, J., Blankman, A., Bogatin, E., Neves, A., Noh, G., Spadaro, M., “Robust Method for Addressing 12 Gbps Interoperability for High-Loss and Crosstalk-Aggressed Channels”, DesignCon 2012

DeGroot, D., Blankman, A., Bogatin, E., "A Practical Approach for Using Circuit Board Qualification Test Results to Accurately Simulate High Speed Serial Link Performance", DesignCon, 2012

Bogatin, E., Loyer, J., , Olufemi Oluwafemi, and Hall, S., “Rethinking How Signals Interact with Interconnects”, DesignCon 2011.

Scogna, A.C, and Bogatin, E. “Analysis of return path discontinuities in multilayer PCBs and their impact on the signal and power integrity”, in IEEE Int’l Symposium on EMC, 2010.

Bogatin, E., DeGroot, D., Gupta, S., Warwick, C., “Frequency Dependent Material Properties- so what?”, DesignCon 2010, Best paper award

E. Bogatin, L. Simonovich, C. Warwick and S. Gupta, “Practical Analysis of Backplane Vias for 5 Gbps and Above,” paper 7-TA2, DesignCon 2009., best paper award

Torres, M. and Bogatin, E. “Signal integrity parameters for health monitoring of digital electronics”, 2008 International Conf on Prognostics and Health Monitoring

Andes, J., and Bogatin, E., “The socket response to current packaging and test trends”, IEEE CPMT SEMI 29th Int’l Electronics Manufacturing Technology Symposium, 2004.

F. Perezalonso;B. Crawford;R. Bernard;R. Kaw;S. Thomas;E. Bogatin, “Electrical characterization of VLSI packages”, Proceedings and 41st ECTC Conference, 1991.

Bogatin, E., Ghandi, P., Weihe, G, Szeto, S., Lofdahl, C., “Enhanced high speed performance from HDI thin film multichip modules”, Proceedings, 7th IEEE/CHMT International Electronic Manufacturing Technology Symposium, Sept 1989