



Organizer:



Essential Principles of Signal Integrity (EPSI)

May 5-6th, 2011

Intensive Workshops by Dr. Eric Bogatin of Bogatin Enterprises and beTheSignal.com

We are bringing the expert to your doorstep!

Polar Instruments (Asia Pacific) Pte Ltd has partnered with Dr. Eric Bogatin, world's leading trainer and Signal Integrity Evangelist for High Speed PCB Design, Signal Integrity, Testing, Characterization and verification and to bring his expertise to Asia for the benefit of the PCB Design and Manufacturing industry in the region.

Now with hands on labs!

New in 2011 classes, we show you how to use a very easy to use simulation tool, QUCS, and how you can quickly answer common signal integrity problems. This tool runs on any laptop with a Windows OS. We provide you a copy of the tool and all the circuits used in the labs. These are yours to take back.

No previous experience is necessary. Even if you have never done any simulation before, you will find this an incredibly easy tool to use. If you are familiar with SPICE, you will find QUCS to be far easier and more versatile.

To participate in the hands on labs, you must bring your own laptop to the class.

**Ideal for Design and Fab Engineers!
REGISTER NOW!**

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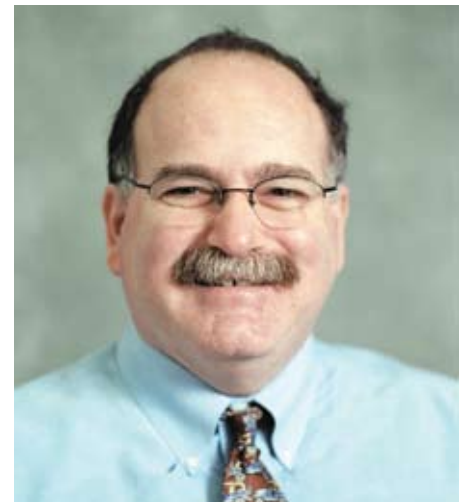
Email or Fax the completed form to
training@polarinstruments.asia or +65 6873 7471
Or call +65 6873 7470

Supporting Partner:



May 5-6th, 2011
9.00am - 5.00pm

Holiday Inn Singapore
Orchard City Centre,
Cavenagh Road



**Dr. Eric Bogatin - President,
Bogatin Enterprises, LLC**

Dr. Bogatin received his BS degree in physics from MIT, and MS and PhD degrees in physics from the University of Arizona in Tucson. He has written five books on signal integrity and interconnects design, over 300 papers and articles and has taught over 4,000 engineers in the last 25 years. He is a distinguished lecturer for the IEEE EMC society and lectures worldwide on signal integrity topics.

**DON'T MISS THIS
VALUABLE CLASS!**

Registration Fee
S\$ 1595*

**Special
Early bird Fee:**

S\$ 1495*
(before 22nd
April 2011)

PLUS: Up to
S\$100/person
discount on groups
of more than 5 people
from the same company.

Price includes course materials, lunch and 2 tea breaks.
*Price includes GST.

EPSI: Essential Principles of Signal Integrity

Build your engineering intuition

The three critical steps to eliminate signal integrity problems from your product are identify the problem, find the root cause and turn the root cause into a design guideline. But every product is unique and custom. Designing a robust and cost effective product is not about blindly following a general set of design rules, rather it is about following a process that helps you apply your engineering intuition to balance cost and design tradeoffs specific to your product.

Learn this process used by thousands of engineers and build your engineering intuition with this two-day class, designed and offered by Signal Integrity Evangelist Dr. Eric Bogatin. In this introductory class the math is stripped away to reveal the underlying truth of how interconnects affect signal integrity. The most essential principles of signal integrity are introduced and reviewed, including principles of:

• Characteristic impedance, return current	• Ground bounce and cross talk
• Reflections	• Bandwidth
• Inductance	• Terminations
• Impedance	• PDN and EMI

Each of these principles is illustrated by examples of measurements or simulations using structures such as IC packages, connectors, printed circuit boards and cables.

Class Outline

Day One

Signal Integrity Problems and Solutions

- The three most important principles in signal integrity
- The six families of signal integrity problems and their solutions
- The ten habits of highly successful designers

Characteristic Impedance and Return Currents

- The instantaneous impedance all signals see
- Characteristic impedance and transmission lines
- Return currents in transmission lines

Reflections, Terminations and Topologies

- The origin of reflections
- Measuring and simulating reflections
- Termination and topology strategies

Hands on Lab

- The TDR and transmission lines
- Driving a transmission line
- Termination, topology and power consumption
- Signal quality with a discontinuity
- How long a stub is too long

Day Two

Cross Talk in Transmission Lines

- Capacitive and inductive coupling
- Influence of propagation direction on cross talk
- The origin of NEXT and FEXT in coupled lines
- Minimizing NEXT and FEXT by design
- Creating design rules for acceptable cross talk

Ground Bounce

- The physical basis of inductance
- Total inductance and the return path
- Minimizing ground bounce in packages, connectors, vias and planes
- The importance of return vias

PDN and EMC design

- The target impedance and impedance profiles
- Selecting decoupling capacitor values
- Common currents as the source of emissions
- Reducing common currents by design
- Reducing emissions with band aides

Hands on Lab

- Simulating ground bounce
- Ground bounce and termination
- An impedance analyzer
- Impedance profile of 1, 3, and 10 capacitors
- Reducing peak impedances by design

Visit bethesignal.com or polarinstruments.asia for more details

RECHARGE your Engineering Skills for SI Design, Test & Verification.

Also Available:

PUBLIC / IN-HOUSE CLASSES (2 Days) & BOOT CAMPS (1 Day)

Courses on High Speed Signal Integrity Design, Principals, Testing, Characterization and Validation techniques. Intensive one day boot camps on designing for high-speed serial links like PCIe, SATA, SAS, XAUI, GigE, USB or LVDS or designing, controlling, and characterizing transmission line losses.

ONLINE CERTIFICATION / CONTINUING EDUCATION COURSES / TRAINING - WEBINARS / LECTURES / RESOURCES

Online Certification courses on topics like essential Principals of Signal Integrity, Continuing Education Courses (CEC) and other training courses through “**No Myths Allowed**” webinars and lectures.

CORPORATE / INDIVIDUAL – ANNUAL or QUARTERLY SUBSCRIPTIONS

Time limited – annual, quarterly and soon to be offered monthly - Corporate / Individual subscriptions are available to access a wealth of resources related to SI design, test, characterization and validation.

Other Courses from Bogatin Enterprises LLC., USA :

PDN : Power Delivery Networks

Topics covered include:

- How do you select capacitors? How many, what value?
- Where should they be placed?
- When does location matter?
- How will you know if you got it right?
- What’s important in the stack up design?
- When is it worth it to use ultra thin laminates?
- What are good habits every layout designer should know?

SPSI : S parameters for SI

Topics covered include:

- The value of Insertion and return loss
- Single ended and Differential parameters
- How to extract characteristic impedance and differential impedance
- Identifying mode conversion problems and solutions
- The ten item check list to evaluate all S-parameters
- The four most important patterns you will see and what they tell you

TVD : Transparent Via Design

Topics covered include:

- Single ended Vias
- Differential Vias
- Corners, bends and serpentines
- Neck downs in BGA fields
- Solder balls
- Connectors
- Terminating resistors
- DC blocking capacitors

For more details visit: www.bethesignal.com and www.polarinstruments.asia

About Polar Instruments, Asia Pac

Headquartered in Singapore and with offices in Japan, Polar Instruments (Asia Pacific) Pte Ltd was established in 1999, as a wholly owned subsidiary of Polar Instruments Ltd, Guernsey, UK to provide sales, marketing and after sales support to customers in the then emerging Asia Pacific region. Now an independent company, Polar Asia Pac provides a range of value added services that include market research and development, product sales, marketing, and after sales support for our principals in the Asia Pacific region covering Australasia, Japan, to the Middle East. Our services include application support, repair & calibration, on-site/off-site maintenance services, and a range of professional consulting services for training, design, test, failure/data analysis and co-relation studies related to our current market space.

www.polarinstruments.asia

About Wizlogix Pte Ltd

Founded in 2000, Wizlogix is a well established and highly professional Printed Circuit Board (PCB) Design company. Currently the largest in Singapore, Wizlogix specializes in PCB design using high-end CAD software like Mentor Graphics Board Station and PADS, Cadence Allegro and Altium. It also provides full turnkey services like PCB design and fabrication to assembly for quick-turn prototype design (with component sourcing). Since 2009, it has conducted PCB SI & EMI, and IPC-CID workshops in Singapore.

www.wizlogix.com

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