

3-Day Practical High Speed PCB Design with EMC Measurements

Signal Integrity and EMC

With the advancement of today's technology, high-speed devices have rise/fall times as fast as 1 ns and below. Signal traces in the printed circuit board (PCB) can no longer be treated as simple short-circuit interconnects; instead they behave as transmission lines. The fast slew rate can contribute to signal integrity (SI) and electromagnetic interference (EMI) problems, such as impedance mismatch, signal reflection, crosstalk, ground bounce and radiation. Thus, it is highly possible that a high-speed PCB fails to work properly and violate the electromagnetic compatibility (EMC) test, due to SI and EMI issues. Proper PCB design techniques and good understanding of high-speed concepts are required to ensure the smooth transition from circuit design to first prototype and final product.

Course Outline

Day 1

Introduction to Signal Integrity and High-Speed PCB

- What are SI and High-Speed PCB
- What are the common problems in High-Speed PCB

Transmission Lines and Signal Propagation

- What are transmission lines and critical length
- Effects of signal reflections to digital circuitry functionality and timing
- Transmission lines termination schemes (Series, Parallel, RC, etc)
- Discontinuities in transmission lines
- Periodic pulses and knee frequency
- Attenuation and dispersion
- Layout techniques for transmission lines

PCB Stack-up

- What are the factors in selecting PCB stack-up
- What parameters affect trace impedance
- Stack-up configuration that promotes good SI
- Steps to make a good PCB stack-up

Hands-on Session: [Demonstrating SI issues via simulation/measurement](#)

Day 2

Differential Signaling

- Why use differential signaling
- Importance of symmetrical and equal length routing
- How to select suitable W/S for controlling differential impedance (Z_{diff})
- Layout techniques for differential pairs

Crosstalk

- What causes crosstalk and what are the effects on signal and timing
- Factors that affect near-end and far-end crosstalk
- What factors can be controlled for minimizing crosstalk
- Layout techniques for minimizing crosstalk

Quality high-speed PCB Design Procedure

- Steps in designing high-speed boards
- Component placement planning and routing topology
- Other aspects - Minimize EMI and ground bounce
- Useful tips for achieving good SI

Hands-on Session: [Demonstrating SI issues via simulation/measurement](#)

Day 3

Introduction to Electromagnetic Compatibility (EMC)

- Aspects of EMC
- Importance of EMC
- Common EMC units
- International and national standards

Radiated Emissions

- Differential-Mode and Common-Mode currents
- Radiated emission models
- Compliance Measurement setup and test procedures

Radiated Susceptibility

- Susceptibility models for wires and PCB lands
- Compliance Measurement setup and test procedures
- Shielding to protect susceptible equipment

Conducted Emissions

- Differential-Mode and Common-Mode currents again
- Line Impedance Stabilization Network
- Power-line filters
- Compliance Measurement setup and test procedures

Conducted Susceptibility

- Electrostatic discharge
- Electrical fast transient
- Lightning surge
- RF current conducted immunity
- AC mains supply dips, dropouts and interruptions

Test Facilities

- Open Area Test Site (OATS)
- Anechoic chambers
- Screen rooms
- Reverberation chamber
- TEM and other specialized test cells

Hands-on Session: [EMC Measurements at Anechoic Chamber](#)

A Joint Public Training Session between Go Training and Center for EMC, UTHM



*"Useful PCB design tips"
"No complicated formula"
"Explained with simple analogy"
"Transmission lines & Crosstalk measurements"
"Witness EMC measurements at Anechoic Chamber"*

Date: 15~17 April 2013 (Monday - Wednesday)

Time: 0900 - 1700

Venue:

University Tun Hussein Onn Malaysia
86400 Parit Raja
Batu Pahat
Johor

Register by 16 March 2013 to enjoy early bird discount.
Certificate will be awarded to participants who complete the training.
Lunch, refreshments and training handout provided and included.
Transportation and accommodation not included.

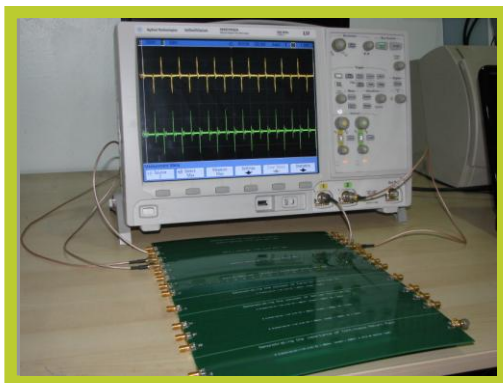
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About the Instructors

Prof. Dr. Mohd Zarar Mohd Jenu is a Professor and Head of the Center for EMC at UTHM. His research interests are EMC, Electromagnetic Shielding, Bioelectromagnetics and Computational Electromagnetics. He is a Certified EMC Engineer by The International Association for Radio, Telecommunications and Electromagnetics (iNarte). He has published numerous papers in local and international journals as well as conference proceedings and has won 15 medals in national and international exposition on research products. He is an IEEE Senior Member, an IEE Technical Panel on Electromagnetics, and was the Vice Chair of the AP/MTT/EMC Chapter IEEE Malaysia Section. The Center for Electromagnetic Compatibility, UTHM was his brainchild and recognized as the first of its kind in Malaysia which provides testing, consultancy and research services to various government agencies and industries.



Mr Chai Ched Chang received his B.Eng (Hons) from University of Malaya, and M.EngSc from Multimedia University, Malaysia. Mr Chai began his career as a Signal Integrity engineer in 2001, specialized in designing High-Speed PCB. He had delivered many consumer electronics PCB designs, where he is specifically experienced in resolving SI issues associated with high-speed memory (SDRAM, DDR, DDR2, DDR3), differential signaling (LVDS, HDMI, USB, PCI Express, Ethernet), and other digital interfaces (FPGA interface, FLASH memory, Video bus, ADC & DAC). He also has vast experience in making PCB stack-up, high-speed signal simulation and analysis. In 2012, Mr Chai left his former company as Chief Technical Officer, and started his own company, iRtec Consulting Sdn Bhd. With 14 years of combined experience in both research and industry, he continues to strive to provide the best Signal Integrity consultation service to his clients.



Demonstrating SI Issues via Measurement



EMC Measurement in Anechoic Chamber

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WITH LATEST TECHNOLOGY**



Go Training

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(wholly owned by iRadar Sdn Bhd)

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