

3-Day Practical High-Speed PCB Design Methodology

Signal Integrity – Made Simple

Signal Integrity for High-Speed PCB

With the advancement of today's technology, high-speed devices have rise/fall times in sub-ns. 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 due to SI & 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

- > What are SI, EMI, EMC and High-Speed PCB
- > What are the common problems in High-Speed PCB

Transmission Lines and Signal Propagation

- > Lumped versus distributed circuit
- > 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

Signal Return Path and EMI

- > How does high-speed signal return to its source
- > Perforation and splits in reference plane
- > Common mode currents
- > Layout techniques for minimizing EMI

Hands-on Session: Demonstrating SI issues via simulation/measurement

Day 2

PCB Stack-up

- > What factors to consider when making a PCB stack-up
- > How to control trace impedance (Z_0) for microstrip and stripline
- > Criteria of a PCB stack-up configuration that promote good SI
- > Steps in making a PCB stack-up

Differential Signaling

- > The importance of differential signaling
- > EMI issues on differential signaling
- > Which is better: tightly coupled or loosely coupled lines
- > How to select suitable W/S for controlling differential impedance (Z_{diff})
- > Layout techniques for differential pairs

SSN – Ground Bounce

- > What causes ground bounce
- > Effect of ground bounce on driver/receivers voltage levels
- > Methods to minimize ground bounce problem

Hands-on Session: Demonstrating SI issues via simulation/measurement

Day 3

Decoupling Capacitors

- > Functions of bypass capacitors
- > Effects of ESL on capacitors
- > Package vs inductance
- > Placement and layout techniques that minimize loop inductance
- > Power Distribution Network

Crosstalk

- > What causes crosstalk and the effects on signal
- > Factors that affect near-end and far-end crosstalk
- > Crosstalk on microstrip vs stripline
- > 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
- > What analysis is required
- > Timing skew adjustment
- > Useful rules for achieving good SI

Hands-on Session: SI case study via CST software

Public Training Session



"Useful PCB design tips"

"No complicated formula"

"Explained with simple analogy"

"Transmission line termination and crosstalk measurement"

"Hands-on exercise and simulation"

Date: 26-28 August 2013 (Monday - Wednesday)

Time: 0900 – 1700 WIB

Venue: Hotel Novotel Jakarta Mangga Dua Square
Jalan Gunung Sahari Raya No 1
14420 Jakarta
Indonesia

Register by 25 July 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.

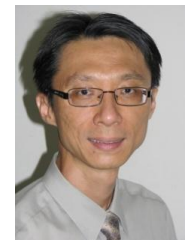


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About the Instructor

Mr Chai Ched Chang received his B.Eng (Hons) from University of Malaya, Malaysia, and M.EngSc from Multimedia University, Malaysia. He was one of the pioneer researchers on Signal Integrity (SI) in Multimedia University. From 1998 to 2001, he had accomplished research projects in crosstalk, PCB modelling using 3-D full-wave Finite-Difference Time-Domain (FDTD) method, and lab measurement. His research outcome was published in reputable international conference and journal through Multimedia University.



Mr Chai then began his career as a Signal Integrity engineer in 2001 at Ultimate Technologies Asia Sdn Bhd, and specialized in designing High-Speed Printed Circuit Board. He had delivered many consumer electronics printed circuit board 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 Ultimate Technologies Asia as Chief Operating Officer and Chief Technical Officer, and started his company, iRtec Consulting Sdn Bhd. With 15 years of combined experience in both research and industry, he continues to strive to provide the best Signal Integrity consultation service with the vision to help his clients design products that meet their stringent quality requirements and shorten their product development cycle.

About Go Training

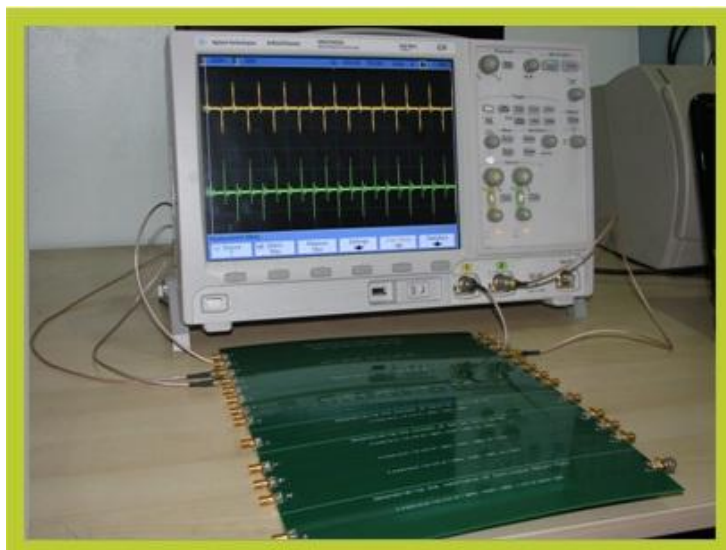
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About Solid Base Technology

Solid Base Technology formed in 2009 in Jakarta, Indonesia as a software, hardware and training provider related to electronics development to support the upcoming electronics and R&D industries in Indonesia that are looking for independency in electronics knowledge as well as to produce Indonesia's own products by local industries. The main focus of our company in Indonesia is to equip customers with knowledge, tools and technology transfer to local industries while ensuring quality and efficiency.

About CST Hands-on Tool

CST offers a wide range of EM simulation tools to address design challenges across the electromagnetic spectrum, from static to terahertz frequency, for wide range of applications, including EDA electronics on SI, EMC & EMI simulations.



Training conducted by:
Go Training (wholly owned by iRadar Sdn Bhd)
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