Lesson: VRPW-30-10: Yoshi's animations of current flow

Course VRPW:

Video Recordings of Presentations and Webinars Section 30: In The Lab With Eric

With Eric Bogatin, Dean, Teledyne LeCroy Signal Integrity Academy

- VRPW-30-10: Yoshi's animations of current flow
 - ✓ The way we learn about current flow in grade school leads to incorrect thinking about current flow in differential pairs
 - ✓ Current through a capacitor
 - ✓ The right way to think about current flow in single-ended transmission lines
 - ✓ With terminations at the end of the line



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My good Buddy Yoshi Tsuji, Ace Application Engineering Manager with Teledyne LeCroy, Japan



A series of flash applications which illustrate important signal integrity principles:

- Current flow
- Cross talk
- Electric fields
- Reflections
- Return loss
- Me, being the signal!

Free to download and use

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Current flow

- See EPSI-01-80 return current
- The wrong way: Battery and light bulb
- The wrong way: Differential pair
- The right way: signal line, terminated at the far end
- The right way: signal line, low impedance at the far end
- The right way: signal line, high impedance at the far end



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Lesson: VRPW-30-12: Yoshi's Animations of Cross Talk

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- VRPW-30-12: Yoshi's Animations of Cross Talk
 - √ Capacitive and inductive coupling
 - ✓ Propagation of capacitive and inductive coupling
 - ✓ Scaling with coupling length
 - ✓ Difference between microstrip and stripline



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Current flow

- See EPSI-07: NEXT, FEXT
- Strongly recommended you review this section in the EPSI course to understand the root cause of NEXT, FEXT
- The nature of capacitive and inductive coupling and their combination
- How the length of the coupling region affects the NEXT and FEXT

7. Cross talk in uniform transmission lines (1hr 30min)

EPSI-07-01 Download a pdf copy of the slides here

EPSI-07-10 Near and Far End Cross Talk

EPSI-07-20 Cross talk and fringe fields

EPSI-07-30 Why NEXT is different from FEXT

EPSI-07-40 Detailed analysis for NEXT and FEXT

EPSI-07-50 Engineering lower NEXT and FEXT
EPSI-07-60 Cross talk as affected by terminations

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Lesson VRPW-30-14: Yoshi's Animations of Electric Field Lines

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VRPW-30-14: Yoshi's Animations of Electric Field Lines

- ✓ Electric field lines and equipotentials when applying a differential signal
- ✓ Scaling with trace to trace separation
- ✓ Applying a common signal
- ✓ When second trace is gnded or floating.



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A series of flash applications which illustrate important signal integrity principles:

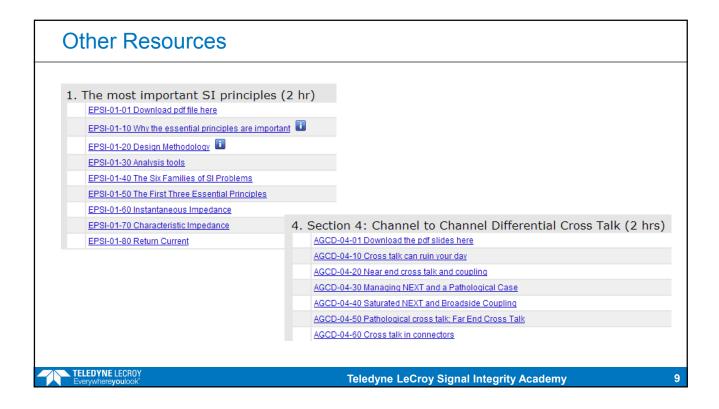
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Lesson VRPW-30-16: Yoshi's Animations of Reflections

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- VRPW-30-16: Yoshi's Animations of Reflections
 - ✓ TDR and TDT, SBR, clocks and sine waves for uniform lines.
 - ✓ TDR and TDT for uniform lines and mismatched ends
 - ✓ TDR and TDT for discontinuities and different rise time
 - ✓ TDR and TDT for stubs



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Reflections

- 3. Reflections and terminations (2hr)

 EPSI-03-01 Download a pdf copy of the slides

 EPSI-03-10 How to Think About Reflections

 EPSI-03-20 Voltage and Current Reflections

 EPSI-03-30 Practice safe simulation

 EPSI-03-40 Noise margins

 EPSI-03-50 Four sources of reflections

 EPSI-03-60 Termination topologies

 EPSI-03-70 Balancing Power and Signal Quality

 EPSI-03-80 Flyby Termination
- 3. Section 3: Data mining return loss (2 hrs)

 SPSI-03-01 Download the pdf slides here

 SPSI-03-03 Special bonus: Download a book here

 SPSI-03-10 S11 as a direct measure of input impedance

 SPSI-03-20 Turning any VNA into an impedance analyzer

 SPSI-03-30 Measuring very low impedance with a VNA

 SPSI-03-40 Example of measuring the impedance of a via

 SPSI-03-50 Thinking of impedance in the time domain

 SPSI-03-60 Interpreting S11 in the frequency and time domains

 SPSI-03-70 Examples of S-parameter measurements



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Lesson VRPW-30-18: Yoshi's Animations of S11 Ripples

Course VRPW:

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- VRPW-30-18: Yoshi's Animations of S11 Ripples
 - ✓ The origin of S11 and S21
 - √ When the length is ¼ a wavelength
 - √ When the length is ½ a wavelength
 - √ Why we see ripples in S11

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A series of flash applications which illustrate important signal integrity principles:

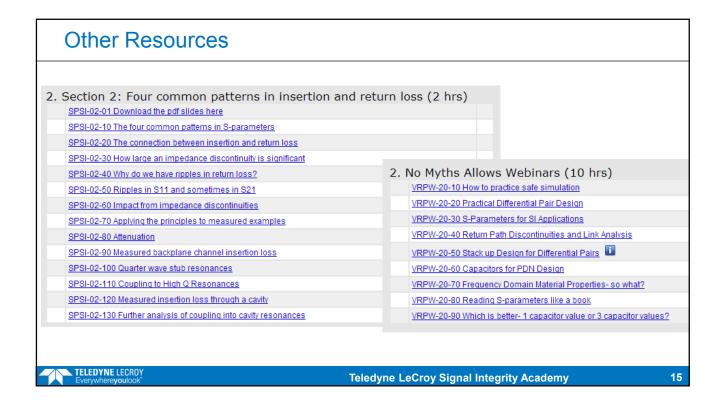
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Lesson VRPW-30-20: Yoshi's Animations of me Being the Signal

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- VRPW-30-20: Yoshi's Animations of me Being the Signal
 - √ A signal launching into a transmission line
 - A signal propagating on a transmission line
 - ✓ Instantaneous impedance the signal sees
 - How to think about characteristic impedance



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Other resources

1. The most important SI principles (2 hr)

EPSI-01-01 Download pdf file here

EPSI-01-10 Why the essential principles are important

EPSI-01-20 Design Methodology

EPSI-01-30 Analysis tools

EPSI-01-40 The Six Families of SI Problems

EPSI-01-50 The First Three Essential Principles

EPSI-01-60 Instantaneous Impedance

EPSI-01-70 Characteristic Impedance

EPSI-01-80 Return Current



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