PPMPMPPMPMPPMPPPMPPPMPPPMP05
Comment se déplace un signal?

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Comment se déplace un signal?

Par: Pascal-Emmanuel Lachance &
Maxime Grenier-Castillo

- Où l'impédance est la plus faible?
- Retour de courant
- Vitesse de déplacement d'un signal
- Tout est une ligne de transmission

Level 1: Surface Ripple [20min]

- Surface Ripple [20min]
  - EM Fields I
  - Superposition I
  - Charge Movement
  - Passive Components I

- Current Paths [30min-50min]

Introduction des mathematiques et équation fondamentales à l'electromagnetisme

- ✔ Champ Vectoriel
- ✘ Divergente, Rotationnelle
- ✘ Regle de la main droite
- ✘ Equation de Maxwell

✖ Équation Linéaire

✖ Addition de Signaux

✘ Comment les Electrons bougent

✘ Propriété materiaux

✖ Resistance

✖ Condensateur

✖ Inducteur

Level 2: Current Paths [30min-50min]

- Surface Ripple [20min]

- Current Paths [30min-50min]
  - Signal Source I
  - Harmonics I
  - Propagation Speed I
  - Ground planes I
  - Induction
  - Current loops
  - Radiation I
  - Fil d'une année lumière de long

- Impedance & Reflection [20min - 1h10]

✖ Source de tension

✖ Source de courant

✖ Transformé de fourier

✖ Addition de Signaux

✖ Taylor

✖ Harmonique paires/impaires

✘ Vitesse de propagation

✘ Speed of light

✖ Item 1

✖ Item 2

✖ GND IS NOT A SINK, IT'S A REFERENCE

✖ Comment les courants sont induits

✖ Regle de la main droite

✖ Item 3

✖ GND Loop avec cable(Ou on place ca apres la section noise?)

✖ Frequency dependant loop

✖ Item 3

✖ Simple Travelling wave

✖ Wavelength

✖ Induction is actually radiation

✖ Stripline radiation Pattern

- ✘ Item 1
- ✘ Item 2
- ✘ Item 3

Level 3: Impedance & Reflection [20min - 1h10]

- Current Paths [30min-50min]

- Impedance & Reflection [20min - 1h10]
  - Signal Source II
  - Impédances I
  - Réflection
  - Transmission Line I

- Noise [27min - 1h37]

✖ Type of source

✖ High/Low Impedance

✖ GPIO output circuit

✘ PPPPP2

✘ Impedance dans le plan complexe

✘ Rappel qu'on ignore la conductance G.

✘ Bounce Diagram

✘ Impedance Mismatch

✘ Item 3

✖ Equation de base

✖ Pertes en dB (exponential decay)

Level 4: Noise [27min - 1h37]

- Impedance & Reflection [20min - 1h10]

- Noise [27min - 1h37]
  - Decibel Review
  - Signal Source III
  - Noise Spectrum
  - Harmonics II
  - Signal to Noise Ratio (SNR)
  - Jitter
  - Eye diagram

- Crosstalk & Coupling [18min - 1h55]

✖ Pourquoi c'est important

✖ Analogie des dB avec le stock market

✖ Item 3

✘ Random Noise Source

✘ Noise Power

✘ Source of noise in a circuit

✖ Frequency dependant noise power

✖ Demo avec type de bruit (red, white, brown, etc..)

✖ Gauss representation in frequency domain of a sine wave

✖ Sinc function

✖ Item 3

✖ Why it matters

✖ How can you tell the SNR you need

✖ Shannon-Hartley Theorem

✖ Application: DAC,ADC

✖ Application: Example for Voyager 1 Detection Link

✖ Item 1

✖ Item 2

✖ Item 3

- ✖ Item 1
- ✖ Item 2
- ✖ Item 3

Level 5: Crosstalk & Coupling [18min - 1h55]

- Noise [27min - 1h37]

- Crosstalk & Coupling [18min - 1h55]
  - Impedances II
  - Radiation II
  - Differential Pairs
  - Far crosstalk
  - Near crosstalk

- Basic Building Blocks [12min-2h07]

- ✖ Item 1
- ✖ Item 2
- ✖ Item 3

✘ Impedance du vide

✘ How its related to radiation

✘ Twisted Pairs

✘ Radiation Pattern

✘ Radiation Lense

✖ Item 1

✖ Item 2

✖ Do Differential Pairs need GND?

- ✖ Item 1
- ✖ Item 2
- ✖ Item 3

✖ Item 1

✖ Item 2

✖ Item 3

Level 6: Basic Building Blocks [12min-2h07]

[5min-Max] Level 6: Signal Source IV – Plan

✖ Crystals

✖ Oscillators

✖ Item 3

✘ Transfer fonction

✘ Item 2

✘ Item 3

✖

✖

✖   Transmission/Frequency plot

✘ Explain Strip line

✘ Show other structures

✘ CPWG, Microstrip, GCPWG

Level 7: Field lines and Fringes [20min-2h27]

- Basic Building Blocks [12min-2h07]

- Field lines and Fringes [20min-2h27]
  - Ground Planes II
  - Waveguide II
  - Skew, loss
  - Skin effect
  - EMI

- Dielectric Depths [26min-2h49]

✖ item 1

✖ item 2

✖ item 3

✖ stripline Field

✖ Microstrip Field

✖ CPWG, GCPWG field

✖ Item 3

✘ Item 1

✘ Item 2

✘ Item 3

✖ Item 1

✖ Item 2

✖ Item 3

- ✖ Item 1
- ✖ Item 2
- ✖ Item 3

Level 8: Dielectric Depths [26min-2h49]

- Field lines and Fringes [20min-2h27]

- Dielectric Depths [26min-2h49]
    - Conduction
    - Loss tangent
    - Passive Component II
    - Current Bunching
    - Stackup I
    - Dispersion
    - Fin premiere Partie

- Advanced Building Blocks [17min-3h06]

✖ Conduction G

✖ Substrate vibration

✖ Item 3

✖ Item 1

✖ Item 2

✖ Item 3

✘ Frequency-dependant passives

✘ Item 3

- ✖ Item 1
- ✖ Item 2
- ✖ Item 3

- ✖ Conversion
- ✖ Lecture datasheet diélectrique
- ✖ Optimisation Stackup
- ✖ Propriété FR4, copper, or, plomb

✘ Ou trouver dans une data sheet de cable

✘ Item 2

✘ Item 3

Fin officiel du PPMPMPPMPMPPMPPPMPPPMPPPMP05. Le reste c'est pour les crinqué

Bonus Level 9: Advanced Building Blocks [17min-3h06]

- ✘ PLL
- ✘ n-Synth
- ✘ Item 3

✖ Rogers

✖ Substrate weave pattern

✖ Avantages / désavantages de certains matériaux

✖ Item 1

✖ Item 2

✖ Item 3

- ✖ Item 1
- ✖ Item 2
- ✖ Item 3

✖ Item 1

✖ Item 2

✖ Item 3

✗ Item 1

✗ Item 2

✗ Item 3

Bonus Level 10: S-Parameters and Smith Charts [17min-3h35]

- Advanced Building Blocks [17min-3h06]

- S-Parameters and Smith Charts [17min-3h35]
  - S-Parameters
  - Smith Charts
  - Impedance Matching Network
  - Standing Waves

- Waveform Abyss [12min-3h18]

✖ Item 1

✖ Item 2

✖ Item 3

✘ Item 1

✘ Item 2

✘ Item 3

✖ Item 1

✖ Item 2

✖ Item 3

- ✘ Item 1
- ✘ Item 2
- ✘ Item 3

Bonus Level 11: Waveform Abyss [12min-3h18]

✖ Impedance Negative

✖ Item 1

✖ Item 2

✖ Item 3

- ✖ Item 1
- ✖ Item 2
- ✖ Item 3

✘   I/Q - Wave Complex Conjugate

✘   negative frequency

✘   Item 3

Bonus Level 12: Non-linearity Valley [14min-3h49]

- Waveform Abyss [12min-3h18]

- Non-linearity Valley [14min-3h49]
  - Passive Component III
  - Superposition III
  - Harmonics III
  - Intermodulation
  - Crossmodulation

- Infrared Chasm [10min-3h59]

✖ Nonlinear passive component models

✖

✘ Superposition breaks

✘ Item 2

✘ Item 3

✘ How non-linearity create harmonics

✘ Item 2

✘ Item 3

✖ Item 1

✖ Item 2

✖ Item 3

- ✖ Item 1
- ✖ Item 2
- ✖ Item 3

Bonus Level 13: Infrared Chasm [10min-3h59]

- Non-linearity Valley [14min-3h49]

- Infrared Chasm [10min-3h59]
  - When the equations fails
  - Electron vibration frequency
  - Blackbody Radiation

- Integrated Photonics [18min-4h17]

- ✘ Item 1
- ✘ Item 2
- ✘ Item 3

- ✘ Item 1
- ✘ Item 2
- ✘ Item 3

- ✖ Item 1
- ✖ Item 2
- ✖ Item 3

Final Boss: Integrated Photonics [18min-4h17]

- Infrared Chasm [10min-3h59]

- Integrated Photonics [18min-4h17]
    - RF Blocks can also be used to guide light
    - We can make circuits with light
    - We can manipulate light using Electrical Signals
    - We can use photonics to generate and manipulate Microwave Signals

✖ Item 1

✖ Item 2

✖ Item 3

- ✗ Item 1
- ✗ Item 2
- ✗ Item 3

- ✖ Item 1
- ✖ Item 2
- ✖ Item 3

[5min - Max] Final Boss: We can use photonics to generate and manipulate Microw Plan

- ✖ Item 1
- ✖ Item 2
- ✖ Item 3

Merci!

Prochain PPPPP

Bonnes pratiques de design

- Comment choisir ses composantes et optimiser son BOM?
- Comment bien concevoir un symbole et un footprint?
- Bonnes pratiques de schémas
- Bonnes pratiques de layout
- Communication avec fabricants, assembleurs et programmeurs