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Circuit Insights - 13-CI: Fundamentals 6 UCLA Behzad Razavi - Circuit Insights - 13-CI: Fundamentals 6 UCLA Behzad Razavi by IEEE Solid-State Circuits Society 18,508 views 2 years ago 26 minutes - ... critical in many **circuits**, such as integrators and amplifiers and all of those are used in the context of **analog**, to digital converters ...
Razavi Electronics 1, Lec 34, MOS Small-Signal Model, PMOS Device - Razavi Electronics 1, Lec 34, MOS Small-Signal Model, PMOS Device by Behzad Razavi (Long Kong) 113,347 views 9 years ago 1 hour, 8 minutes - Small-Signal Model; PMOS Device (for next series, search for **Razavi**, Electronics 2 or longkong)
build a small signal model
constructing a small signal model of a general circuit
find a zero voltage source
draw the small signal model of this circuit
replace this battery with a small signal model
look at the effect of channel length modulation
apply a voltage difference between these terminals
increment the voltage difference between two terminals
increment the drain source voltage
drop out the $1 + \lambda v_{ds}$ factor
analyze various circuits
overdrive voltage
find the small signal model
choose the polarity of the voltage difference between source and drain
define the drain current of a mass device

draw the small signal model of the circuit

draw the small signal model upside down

draw the small signal model of m_2 as a current source

ISSCC 2023 Circuit Insights - ISSCC 2023 Circuit Insights by ISSCC Videos 10,912 views Streamed 1 year ago 4 hours, 51 minutes - This event is dedicated to 3rd and 4th-year undergraduate and starting graduate students interested in **Circuit**, Design. Online ...

Razavi Electronics 1, Lec 42, Op Amp Circuits 1 - Razavi Electronics 1, Lec 42, Op Amp Circuits 1 by Behzad Razavi (Long Kong) 111,172 views 9 years ago 1 hour, 7 minutes - Op Amp **Circuits**, I (for next series, search for **Razavi**, Electronics 2 or longkong)

Op Amp Basics

Operational Amplifiers

Circuits That Are Based on Op Amps

What an Op-Amp Is

Differential Amplifiers

Why Do We Need an Amplifier with Two Inputs

Why Do We Need To Have an Amplifier with Two Inputs

Voltage Gain

Characteristics of the Op Amp

An Ideal Op-Amp

Observations

Gain of an Op-Amp Is High

Amplifiers That Use Op Amps

Non-Inverting Amplifier

Topology

Common Emitter Amplifier

Amplifier Topology

General Equation for the Gain

The Closed Loop Gain

The Inverting Amplifier

Inverting Amplifier

Virtual Ground

Voltage Gain of the Inverting Amplifier

Input Impedance

Gain Is Not Infinite

KCL at the Node

Closed Loop Gain

Razavi Electronics 1, Lec 21, Input & Output Impedances - Razavi Electronics 1, Lec 21, Input & Output Impedances by Behzad Razavi (Long Kong) 55,127 views 9 years ago 1 hour, 3 minutes -

Input & Output Impedances (for next series, search for **Razavi**, Electronics 2 or longkong)

Voltage Headroom

Ideal Current Source

The Common Emitter Stage

Common Emitter Stage

Identify a See Stage

Example

Internal Resistance

Resistive Divider

Attenuation Factor

The Input Impedance

Input Impedance

Input Impedance

Calculate the Input Impedance

Calculate the Input Impedance of the Common Common Emitter Stage

Calculating the Input Impedance of the Amplifier

The Problem of Output Impedance

Problem of Output Impedance

Thevenin Equivalent for the Small Signal Model of the Circuit

The Thevenin Resistance

Thevenin Resistance

Equivalent Circuit

Output Resistance of a Common Emitter Stage

Early Effect What Happens to the Output Impedance

Summary

Tutorial #2: Drawing Schematic and Connecting Microcontroller + Accelerometer (EasyEDA) -

Tutorial #2: Drawing Schematic and Connecting Microcontroller + Accelerometer (EasyEDA) by Robert Feranec 32,296 views 2 years ago 1 hour, 6 minutes - A Step by Step tutorial to help everyone to learn how to design and build a simple microcontroller board. This Part 2 is about how ...

Adding connectors for RGB LED

Connecting LED to a Microcontroller

Connecting Accelerometer

Connecting I2C Accelerometer to MCU

Connecting Interrupt to MCU

Add support for MCU Debugging

Connecting a Button to MCU

Connecting MCU power

Adding I2C header

Annotating Schematic

Mark unconnected pins

Importing Schematic to PCB

Razavi Electronics2 Lec4: Additional Cascode Examples, Cascode Amp with PMOS Input - Razavi Electronics2 Lec4: Additional Cascode Examples, Cascode Amp with PMOS Input by Behzad Razavi (Long Kong) 56,258 views 5 years ago 47 minutes - Greetings welcome to electronics to lecture number four I am is not **Razavi**, today we will take one last look at cascode structures ...

Razavi Electronics 1, Lec 39, Biasing Techniques, Intro. to Common-Gate Stage - Razavi Electronics 1, Lec 39, Biasing Techniques, Intro. to Common-Gate Stage by Behzad Razavi (Long Kong) 70,829 views 9 years ago 1 hour, 6 minutes - Biasing Techniques, Intro. to CG Stage (for next series, search for **Razavi**, Electronics 2 or longkong)

look at the i / o impedances of the degenerated common source stage

take a resistive divider from the battery voltage

find the input impedance of the commissar stage with this resistive divider biasing

use this common source stage as a low noise amplifier

add some degeneration in the source

calculate the bias conditions

connect a resistor between the gate and the drain

find the bias conditions for the circuit

introduce the common gate stage

Reverse engineering a simple CMOS chip - Reverse engineering a simple CMOS chip by Robert Baruch 126,369 views 5 years ago 41 minutes - Reverse engineering a National Semiconductor 54HC00 quad NAND gate ...

Power Pins

Closer Look at the Chip

Power Connection

Diffusion Layer

Label the Nodes

Complementary Logic

PCM - Analog to digital conversion - PCM - Analog to digital conversion by Sunny Classroom 167,057 views 5 years ago 8 minutes, 57 seconds - PCM - method of **analog**, to digital conversion Introduction Today my topic is Pulse Code Modulation or PCM- a method used to ...

Intro

Sampling

A Day in the life of an Analog IC Engineer - A Day in the life of an Analog IC Engineer by MIDAS Ireland 16,764 views 1 year ago 1 minute, 22 seconds - What is a day in the life of an **Analog IC**, Engineer really like? We sat down with, @Sanjana Srikanth Kestur **Analog IC**, Engineer at ...

Razavi Chapter 2 || Solutions 2.1 (for NFET) || Ch2 Basic MOS Device Physics || #1 - Razavi Chapter 2 || Solutions 2.1 (for NFET) || Ch2 Basic MOS Device Physics || #1 by Kishan Suthar 4,193 views 2 years ago 17 minutes - 2.1 || For $W/L = 50/0.5$, plot the drain current of an NFET and a PFET as a function of $|V_{GS}|$ as $|V_{GS}|$ varies from 0 to 3 V. Assume ...

Razavi Electronics 1, Lec 29, Intro. to MOSFETs - Razavi Electronics 1, Lec 29, Intro. to MOSFETs

by Behzad Razavi (Long Kong) 235,727 views 9 years ago 1 hour, 4 minutes - Intro. to MOSFETs (for next series, search for **Razavi**, Electronics 2 or longkong)

Structure of the Mosfet

Moore's Law

Voltage Dependent Current Source

Mos Structure

Mosfet Structure

Observations

Circuit Symbol

N Mosfet

Structure

Depletion Region

Threshold Voltage

So I Will Draw It like this Viji and because the Drain Voltage Is Constant I Will Denote It by a Battery So Here's the Battery and Its Value Is Point Three Volts That's V_d and I'M Very Envious and I Would Like To See What Happens Now When I Say What Happens What Do I Exactly Mean What Am I Looking for What We'Re Looking for any Sort of Current That Flow Can Flow Anywhere Maybe See How those Currents Change Remember for a Diode We Applied a Voltage and Measure the Current as the Voltage Went from Let's Say Zero to 0.8 Volts We Saw that the Current Started from Zero Let's Look at the Current That Flows this Way this Way Here Remember in the Previous Structure When We Had a Voltage Difference between a and B and We Had some Electrons Here We Got a Current Going from this Side to this Side from a to B so a Same Thing the Same Thing Can Happen Here and that's the Current That Flows Here That Flows through this We Call this the Drain Current because It Goes through the Drain Terminal so We Will Denote this by I_d so this I_d and Then this Is I_d

And that's the Current That Flows Here That Flows through this We Call this the Drain Current because It Goes through the Drain Terminal so We Will Denote this by I_d so this I_d and Then this Is I_d this Is Called the Drain Current So I Would Like To Plot I_d as a Function of V_g V_d Constant 0.3 Volts We Don't Touch It We Just Change in V_g so What We Expect Use the G Here's I_d Okay Let's Start with V_g 0 Equal to 0 When V_g Is Equal to 0 this Voltage Is 0

So the Current through the Device Is Zero no Current Can Flow from Here to Here no Electrons Can Go from Here to Here no Positive Current Can Go from Here to Here so We Say an I_d Is Zero Alright so We Keep Increasing V_g and We Reach Threshold so What's the Region Threshold Voltage V_t H Then We Have Electrons Formed Here so We Have some Electrons and these Electrons Can Conduct Current so We Begin To See aa Current Flowing this Way the Current Flowing this Way Starts from the Drain Goes through the Device through the Channel Goes to the Source Goes Back to Ground so We Begin To See some Current and as V_g Increases

Goes through the Device through the Channel Goes to the Source Goes Back to Ground so We Begin To See some Current and as V_g Increases this Current Increases Why because as V_g Increases the Resistance between the Source and Drain Decreases so if I Have a Constant Voltage Here if I Have a Constant Voltage Here and the Resistance between the Source and Drain Decreases this Current Has To Increase So this Current Increases Now We Don't Exactly Know in What Shape and Form Is the Linear and of the Net Cetera but At Least We Know It Has To Increase

Difference between the Gate and the Source between the Gate and the Source this Is Encouraging the Gate and the Source Okay Now Is There another Current Device That We Have To Worry about Well We Have a Current through the Source You Can Call It I_s and as You Can See the Drain Current at the Source Called Are Equal because if a Current Enters Here It Has Nowhere Else To Go so It Just Goes All the Way to the Source and Comes Out so the Drain Current the Source Current Are Equal so We Rarely Talk about the Source Current We Just Talk about the Drain

So We Don't Expect any Dc Current At Least To Flow through this Capacitor because We Know for Dc Currents Capacitors Are Open so to the First Order We Can Say that the Gate Current Is Zero Regardless of What's Going On around the Device so We Will Write that Here and We'll Just Remember that I_g Is Equal to Zero Now in Modern Devices That's Not Exactly True There's a Bit of Gate Current but in this Course We Don't Worry about It Okay Let's Go to Case Number Two in Case Number Two I Will Keep the Gate Voltage Constant

In Modern Devices That's Not Exactly True There's a Bit of Gate Current but in this Course We Don't Worry about It Okay Let's Go to Case Number Two in Case Number Two I Will Keep the Gate Voltage Constant and Reasonable What's Reasonable Maybe More than a Threshold To Keep the Device To Have a Channel so We Say V_g Is Constant Eg One Volt so We Want To Have aa Channel of Electrons

in the Device and Now We Vary the Drain Voltage So I Will Redraw the Circuit and I Put a Variable So We Say V_g Is Constant Eg One Volt so We Want To Have a Channel of Electrons in the Device and Now We Vary the Drain Voltage So I Will Redraw the Circuit and I Put a Variable Sorry I Put a Constant Voltage Source Here Battery So Here's the Battery of Value One Volt and Then I Apply a Variable Voltage to the Drain between the Drain and the Source Really So that's V_d and Again I Would Like To See What Happens and by that We Mean How Does the Current of the Device Change We Have Only Really a Drain Current so that's What We're Gonna Plot as a Function of V_d We Have Only Really a Drain Current so that's What We're Gonna Plot as a Function of V_d so the Plot I_d as a Function of V_d Okay When V_d Is 0 How Much Current Do We Have Well if You Have Zero Voltage across a Resistor We Have Zero Current Doesn't Matter What the Resistor Is Right this One Can Be High or Low but You Have Zero Current So no Current Here but So Again in Your Mind You Can Place the Resistor

If You Have Zero Voltage across a Resistor We Have Zero Current Doesn't Matter What the Resistor Is Right this One Can Be High or Low but You Have Zero Current So no Current Here but So Again in Your Mind You Can Place the Resistor between these Two Points When the Channel Is on We Said It Looks like a Resistor Dried Is a Resistor between Source and Drain and as this Voltage Increases this Color Wants To Increase So this Current Begins To Increase Right Away There's no Constant Threshold on this Side Right because if the Gate Has a Sufficiently Positive Voltage on It There Is Already a Channel of Electrons Here and all We Need To Do Is Increase this Voltage To Increase that Current

Right Away There's no Constant Threshold on this Side Right because if the Gate Has a Sufficiently Positive Voltage on It There Is Already a Channel of Electrons Here and all We Need To Do Is Increase this Voltage To Increase that Current so We Get Something like that and Again We Don't Know Where It Goes Etc but that's the General Shape of It All Right so this Is Called the I_d V_d Characteristic this Is Called the I_d V_g Characteristic and They Are Distinctly Different and They Have Meet They Mean Different Things and We Always Play with these Characteristics for a Given Device To Understand these Properties

There Is Already a Channel of Electrons Here and all We Need To Do Is Increase this Voltage To Increase that Current so We Get Something like that and Again We Don't Know Where It Goes Etc but that's the General Shape of It All Right so this Is Called the I_d V_d Characteristic this Is Called the I_d V_g Characteristic and They Are Distinctly Different and They Have Meet They Mean Different Things and We Always Play with these Characteristics for a Given Device To Understand these Properties Alright Our Time Is up the Next Lecture We Will Pick Up from Here and Dive into the Physics of the Mass Device I Will See You Next Time

Analog Ic Design - Analog Ic Design by NPTEL Feedback 617 views 10 months ago 1 minute, 41 seconds - I have attended **analog IC**, design course and this is a 12-week course and I've already done quite few electronics courses in my ...

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