



HOW TO DEMYSTIFY AUDIO CIRCUITS

KOMA ELEKTRONIK WORKSHOP
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OVERVIEW

- » BASIC (& UNSPOKEN) ELECTRICAL SCHEMATIC RULES
- » COMMON ELECTRICAL CIRCUIT COMPONENTS
- » IDENTIFYING POWER & PROTECTION
- » INTRODUCTION TO TRANSISTORS AND OPAMPS
- » FINDING "STRUCTURES"
- » LET'S APPLY OUR NEW SKILLS

BASIC (& UNSPOKEN) ELECTRICAL SCHEMATIC RULES

- » USUALLY SIGNAL FLOWS LEFT -> RIGHT
- » MANY ELECTRICAL CONNECTIONS ARE OMITTED AND REPRESENTED BY SYMBOLS
- » THE "DOT"
- » GROUPS OF COMPONENTS ARE DESIGNED TO WORK IN FUNCTIONAL BLOCKS
- » NON-ESSENTIAL CIRCUITRY IS SOMETIMES ON OTHER SHEETS
- » THERE ARE GOOD AND BAD SCHEMATICS, BUT THE CIRCUIT IS THE SAME

SCHEMATIC ASSUMES YOU ARE AN ELECTRICAL ENGINEER!!!

COMMON ELECTRICAL CIRCUIT COMPONENTS

- » GND
- » +POWER
- » -POWER
- » RESISTOR
- » CAPACITOR
- » INDUCTOR
- » DIODE
- » TRANSISTOR
- » OPAMP (OPERATIONAL AMPLIFIER)
- » POTENTIOMETER (KNOB)
- » SWITCH
- » CONNECTOR
- » FUSE
- » ...

IDENTIFYING POWER & PROTECTION

BASICALLY ONLY 3 TYPES OF ONBOARD

POWER CIRCUITS

- » AC IN -> DC OUT (RECTIFIER)
- » DC IN -> DC OUT (LDO)
- » DC IN -> DC OUT (BUCK/BOOST)



PROTECTION CIRCUITS VARY A LOT

DEPENDING ON THE PURPOSE

- » OVERVOLTAGE
- » OVERCURRENT
- » REVERSE VOLTAGE
- » STATIC DISCHARGE
- » ...

INTRODUCTION TO TRANSISTORS AND OPAMPS

TRANSISTOR TYPES

- » NPN-BJT OR N-FET
- » PNP-BJT OR P-FET

TRANSISTOR CONFIGURATION

- » VOLTAGE FOLLOWER
- » LOGIC INVERTER
- » AMPLIFIER
- » ...

OPAMPS CONFIGURATIONS

- » ANALOG COMPARATOR (& SCHMITT)
- » VOLTAGE FOLLOWER, IMPEDANCE DECOUPLER
- » AMPLIFIER (INV. OR NON-INV.)
- » SUMMING MIXER (INV. OR NON-INV.)
- » ADVANCED MATHEMATICAL FUNCTIONS
- » FILTERS & NON-MATHEMATICAL FUNCTIONS
- » ...

INTRODUCTION TO TRANSISTORS AND OPAMPS

TRANSISTORS AND OPAMPS (OPERATIONAL AMPLIFIERS) ARE ORDINARY COMPONENTS.

HOWEVER, THEIR **FUNCTION** IS HIGHLY DEPENDENT ON THE **CONFIGURATION** THAT THEY ARE DEPLOYED IN. CONSIDER THEM BUILDING **BLOCKS**.

THESE BLOCKS ARE LIKE INDIVIDUAL MODULES THEMSELVES. ONCE YOU FIND THEM, THEIR PURPOSE IS IMMEDIATELY CLEAR.

FINDING "STRUCTURES"

DON'T GET BAMBOOZLED BY THE VALUES OR NAMES OF COMPONENTS. THESE BLOCKS WORK INDEPENDENT OF THAT, SINCE THEIR FUNCTION IS DETERMINED BY THE CONNECTIONS THEY ARE MADE OF.

-> VALUES ONLY PLAY A ROLE IN THE PARAMETERIZATION OF THESE FUNCTIONS

USE THE PATTERN RECOGNITION PART OF YOUR BRAIN TO IDENTIFY STRUCTURES

FINDING "STRUCTURES"

CONNECTING FUNCTION BLOCKS IN A MEANINGFUL WAY CREATES NEW FUNCTIONS.

THESE I LIKE TO CALL **STRUCTURES**.

THE WORLD IS A STRUCTURAL FRACTAL

LET'S APPLY OUR NEW SKILLS

RECOMMENDED LITERATURE

BEGINNER FRIENDLY

- » THE ART OF ELECTRONICS, *PAUL HOROWITZ & WINFIELD HILL*
- » ELECTRICAL ENGINEERING 101, *DARREN ASHBY*
- » ACTIVE FILTER COOKBOOK, *DON LANCASTER*

THE HOLY BIBLE OF ELECTRICAL ENGINEERING

- » HALBLEITER-SCHALTUNGSTECHNIK, *TIETZE/SCHENK/GAMM* (GERMAN)
- ELECTRONIC CIRCUITS: HANDBOOK FOR DESIGN AND APPLICATION (ENGLISH)