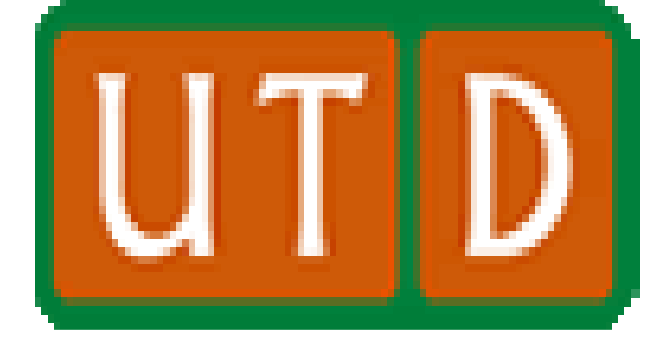


# Reverse Engineering and Rebuilding an IC chip

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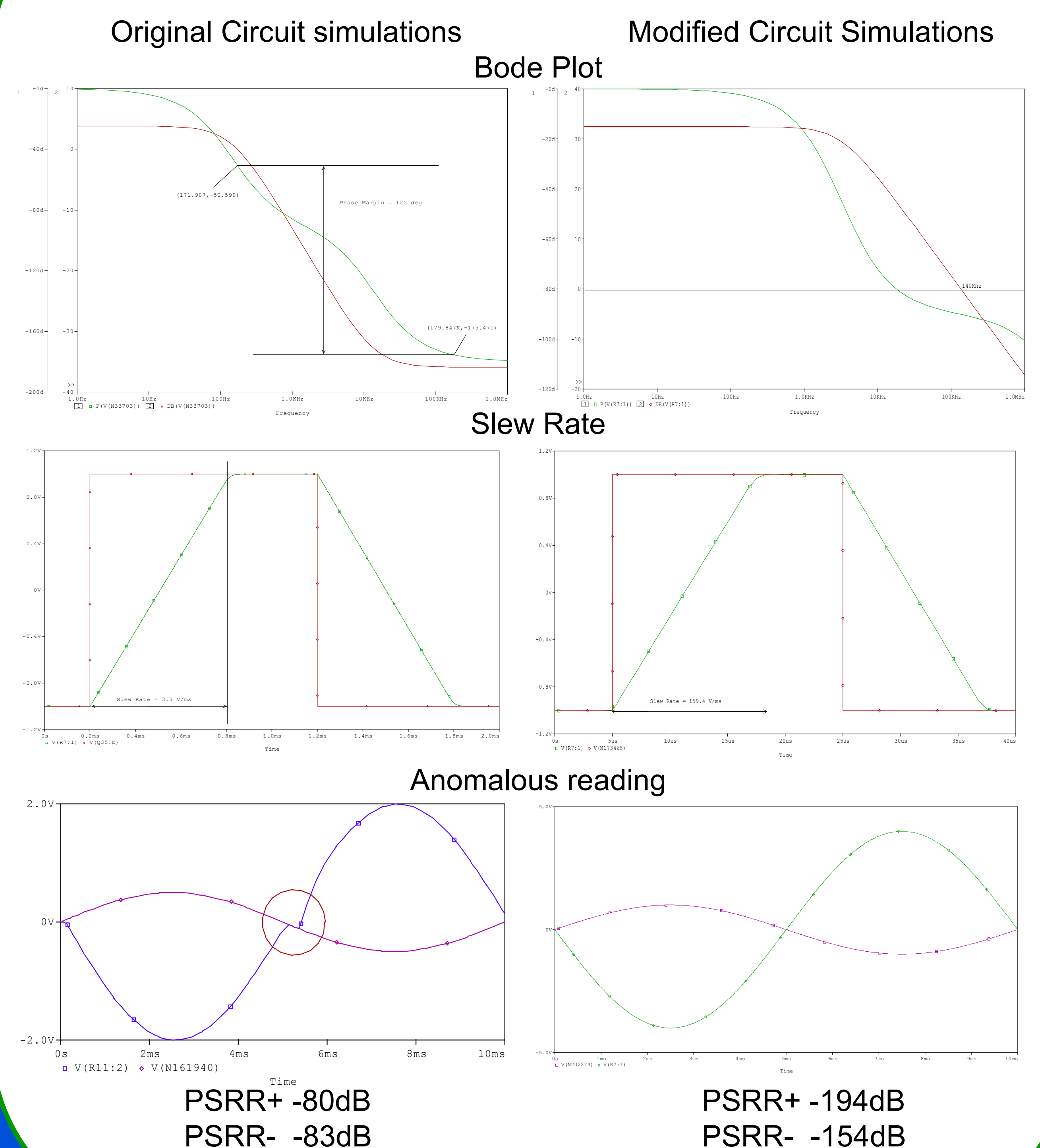
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## Project Goals:

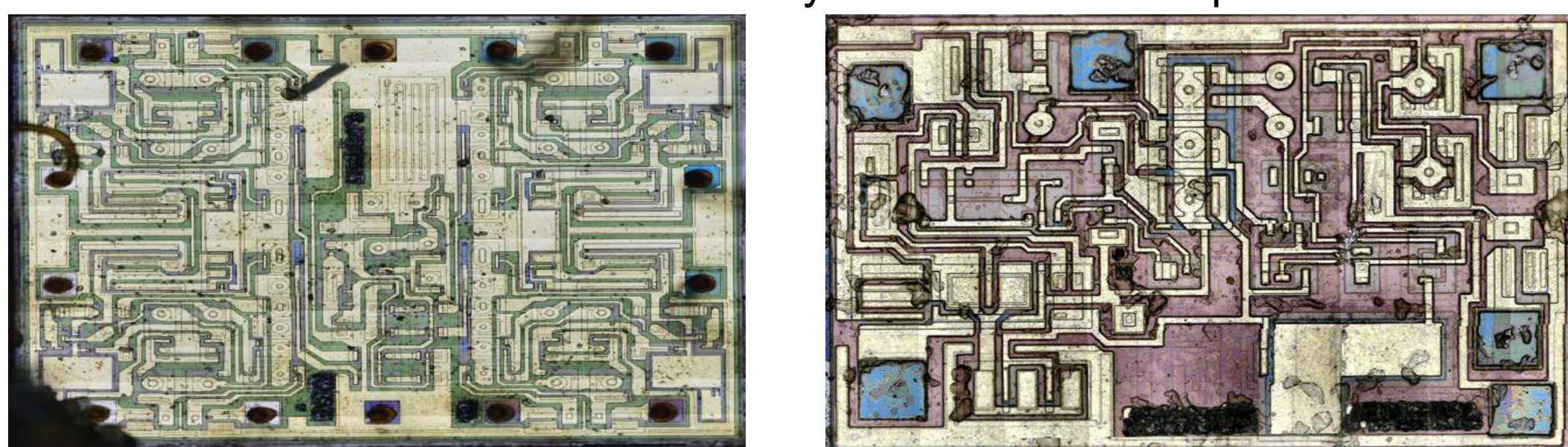
- ◆ Obtain die photographs in order to recreate the circuit
- ◆ Research the topology of the components on the IC
- ◆ Create a schematic and identify different amplifier stages
- ◆ Simulate and test the devices
- ◆ Enhance the of devices to operate within new specifications

## Project Results:

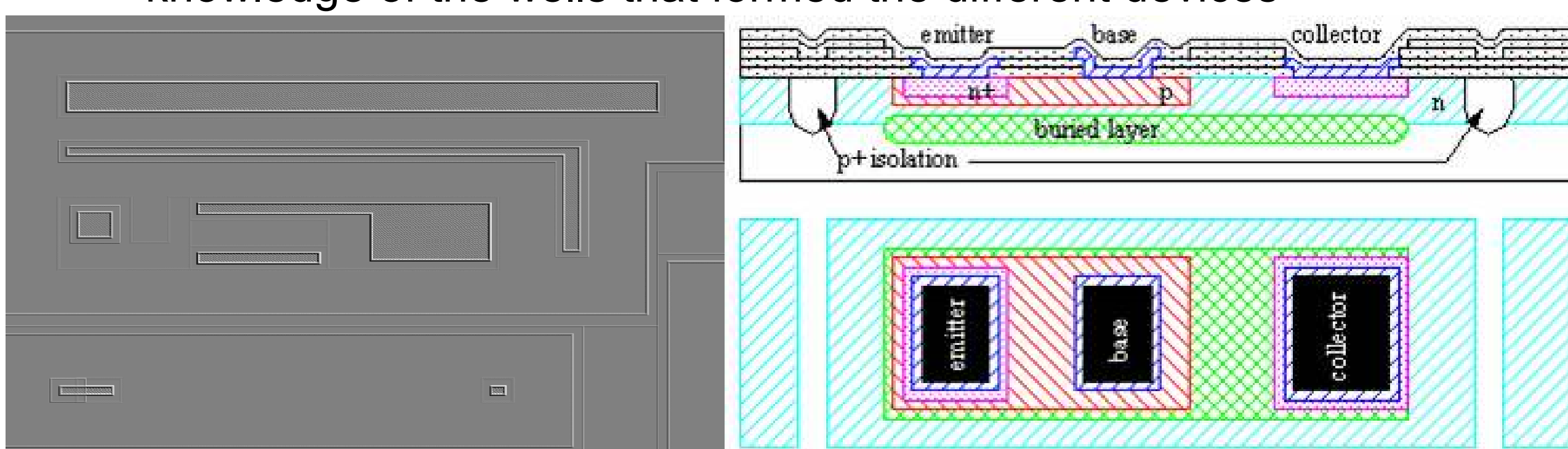


## Project Overview:

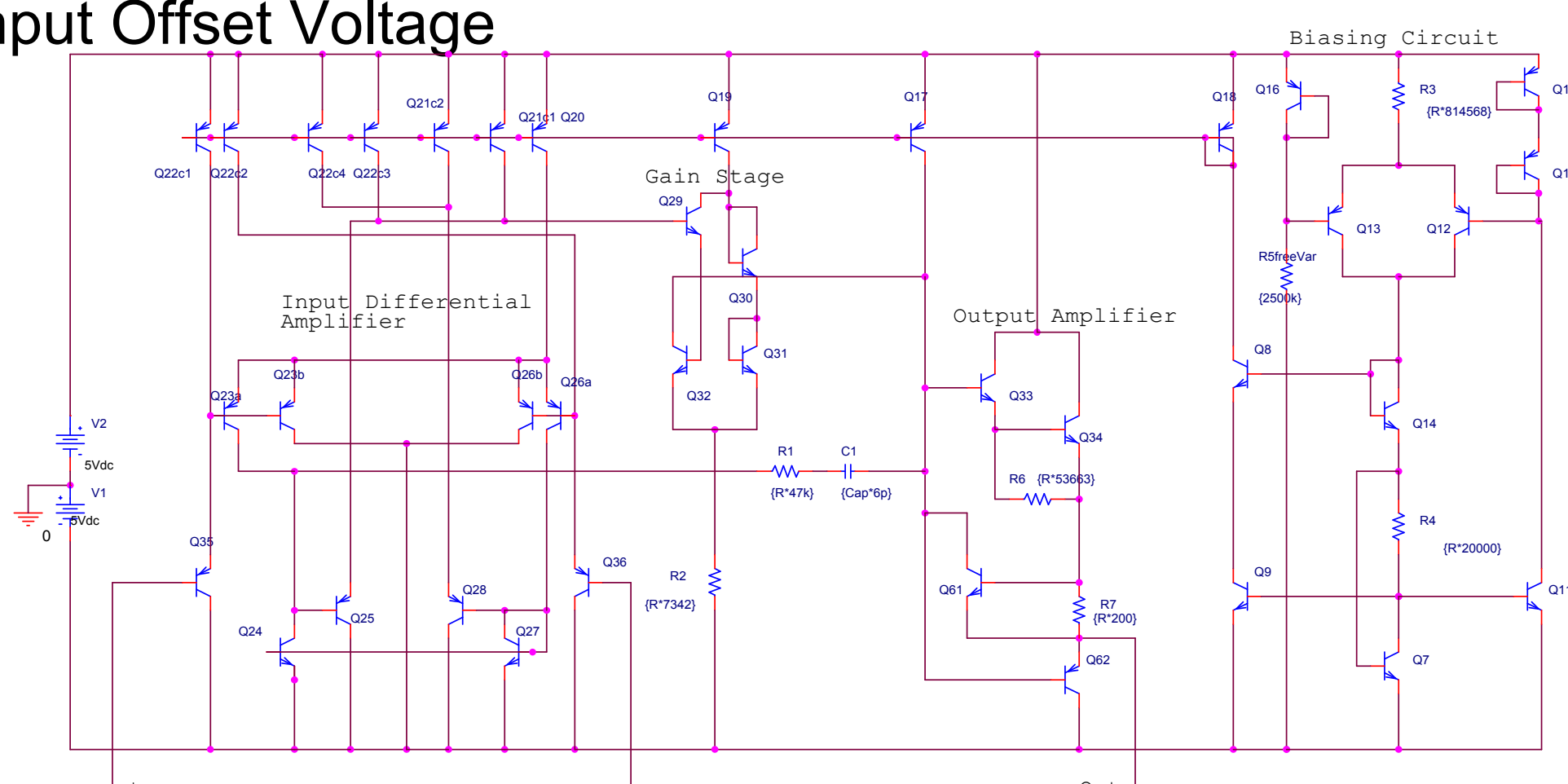
- ◆ **Process**
- ◆ Gain access to a microscope in order to obtain pictures of the Die with a sufficient resolution to identify the individual components.



- ◆ Recreate the circuit using the pictures and measure the components to identify the devices original operating parameters
- ◆ This required an understanding IC design and an intimate knowledge of the wells that formed the different devices



- ◆ Recognize the different amplifier stages in the device and their effects on different operating parameters including:
  - ◆ Slew rate, Gain, Operating Power, Phase margin, PSRR, CMRR, Input Offset Voltage



- ◆ Finally we modified the original design with the above limitations to create a device that fit the required parameters.

## Project Conclusions/Outcomes:

- ◆ Testing of the Operational Amplifier, with a reasonable approximation of the original component values, lead us to the conclusion that the device originally operated at a low bandwidth with moderate gain. Although we believe the actual device specifications to be higher, we found
  - ◆ Gain  $\approx$  3 dB, BW  $\approx$  100 Hz, and SR  $\approx$  3 V/ms.
  - ◆ After modifying key components in the circuit we were able to change most of the operating parameters to the customer requested level, though we failed to produce an acceptable gain, all other parameters meet or exceeded expectation.
  - ◆ Gain  $\approx$  32 dB, BW  $\approx$  140 kHz, and SR  $\approx$  159 V/ms
  - ◆ more unique and complex structures in the circuit made it difficult to identify components and slowed our progress considerably