



Seminar A/B

Custom Bias Control Circuit for a Chip Testing Platform

Description

We recently put a prototype of our chip in production and expect the delivery in a few months. To test the functionality and evaluate its performance, a test PCB will be designed. As part of the measurement process, a close measurement & control of the bias currents respectively bias voltages is needed. A Microcontroller is available on the test board. The design of such a bias current/voltage circuit is part of this seminar.

Our chip needs multiple bias voltages for operation. Internally, bias currents are generated from the applied bias voltages. The actual internal bias current is critical for the performance and shall be precisely controllable to evaluate the chip performance under various circumstances. The internal bias currents are mirrored and available via pins at the outside for measurement. A digital feedback system can be implemented, which measures this bias current and adjusts the applied bias voltage to reach the targeted value.

The first task is to develop a suitable circuit based on off-the-shelf components. A Digital-to-Analog converter (DAC) is needed to provide a controllable bias voltage. Depending on its driving capability, an additional buffer might be needed. The current measurements can be done with a shunt resistor and an instrumentation amplifier. The output voltage signal can be read back using an Analog-to-Digital Converter (ADC). Components can be selected based on their datasheets, but unfortunately availability of these parts need to be considered. In case of severe shortage of parts, extensive support will be offered. If sufficient, the integrated ADCs and DACs of the microcontroller can be used. Secondly, a small, minimal PCB with the developed circuit shall be designed and then tested in our laboratory. Lastly, the feedback loop shall be implemented using the C programming language on the microcontroller and the overall system tested. Upon success we will incorporate the design on our test PCB for the chip.

Tasks

- Bias voltage control & current readback circuit
- Design of a minimal test PCB
- Microcontroller based implementation in C

Requirements:

- Fundamentals of electronics
- Fundamental in C programming language
- Experience in PCB Design is a plus

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