應用於植入式生醫元件之互補式金氧半導體13.56-MHz位準鍵移解調變器之資料回傳電路

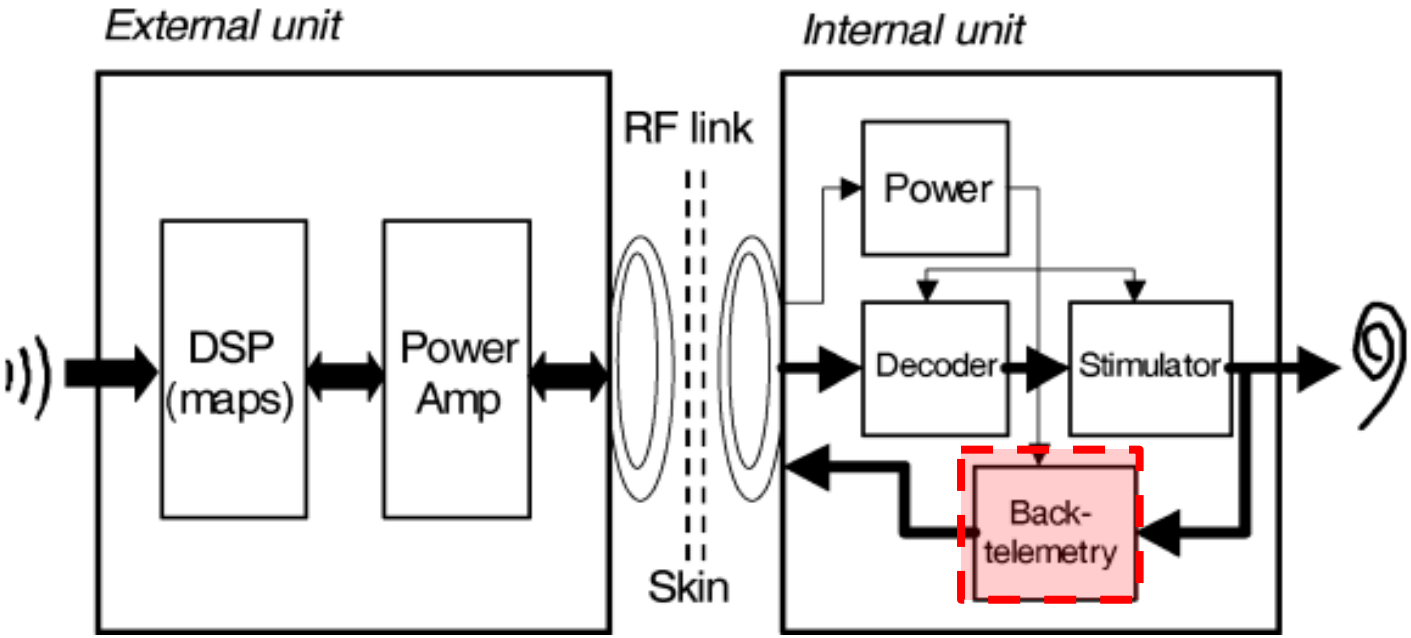
The Design of CMOS 13.56-MHz Back Telemetry Circuit with a Level Shift Keying Demodulator for Biomedical Implants

專 題 生：祝暄惠 Hsuan-Hui Chu

指導教授：吳重雨 Chung-Yu Wu

Background

- This is an implantable medical device for cochlear implant.
- The function of back telemetry is for the external unit to check the status of the internal unit.



F-G Zeng, S. Rebscher, W. Harrision, X. Sun, and H. Feng, "Cochlear implants: System design, integration, and evaluation," *IEEE Rev. Biomed. Eng.*, vol. 1, pp. 115–142, 2008.

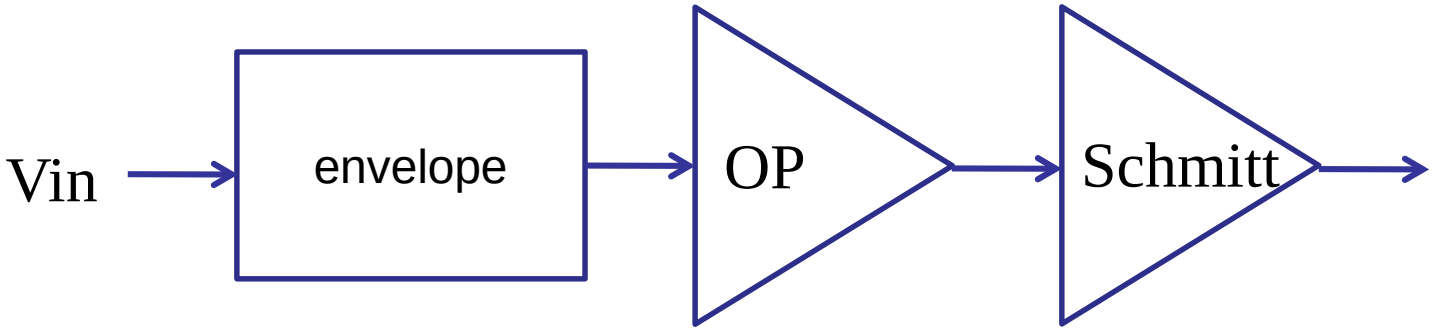
Back Telemetry

- There are three major kinds of back telemetry
- LSK uses only one pair of coils to transmit power and data

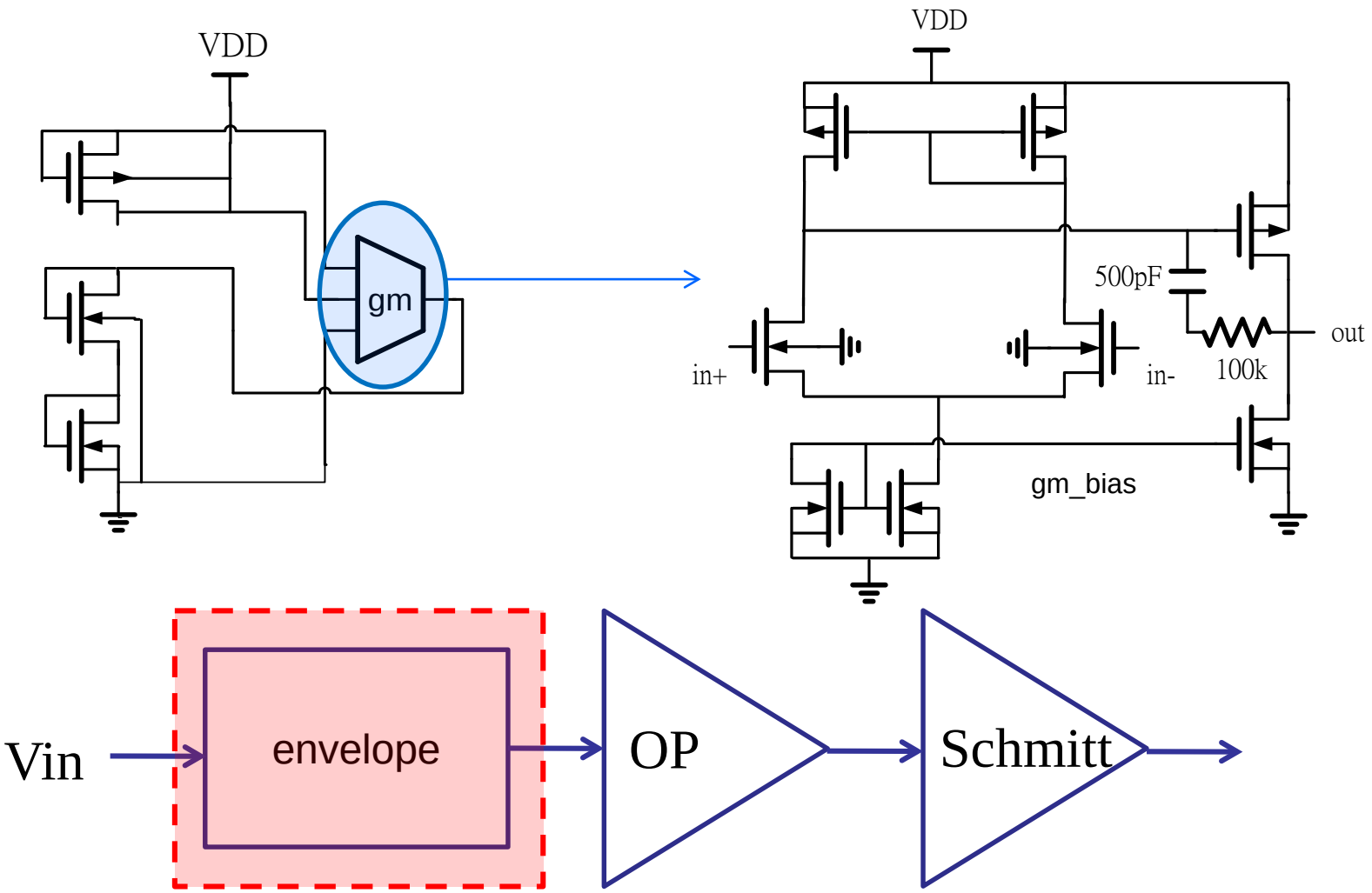
	Pros	Cons
LSK	low power consumption	Limited power ratio
PSK	good power efficiency simple system	Can't distinguish b(t) or -b(t)
FSK	more bandwidth efficiency	more prone to error

Block Diagram

- First stage: envelope
  - Provides an output which is the envelope of the original signal
- Second stage: operational amplifier
  - Amplifies the incoming signal
- Third stage: Schmitt trigger
  - Signal conditioning

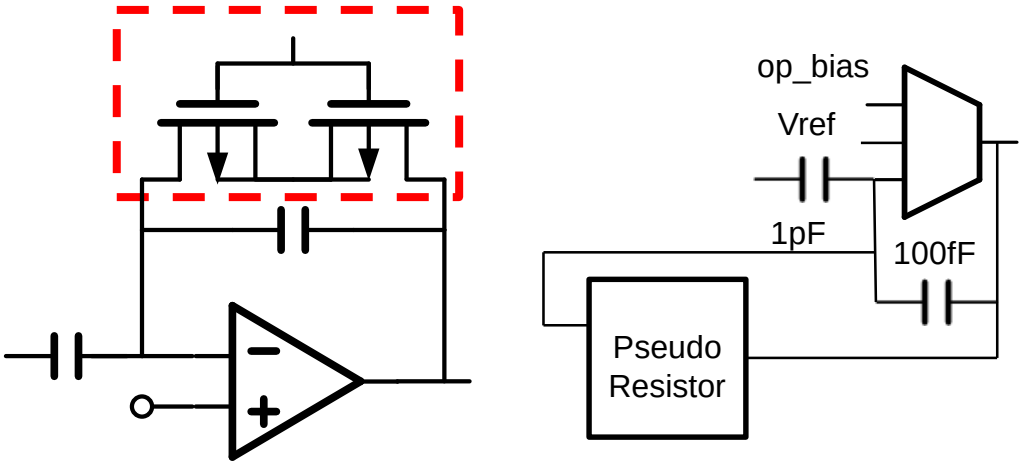


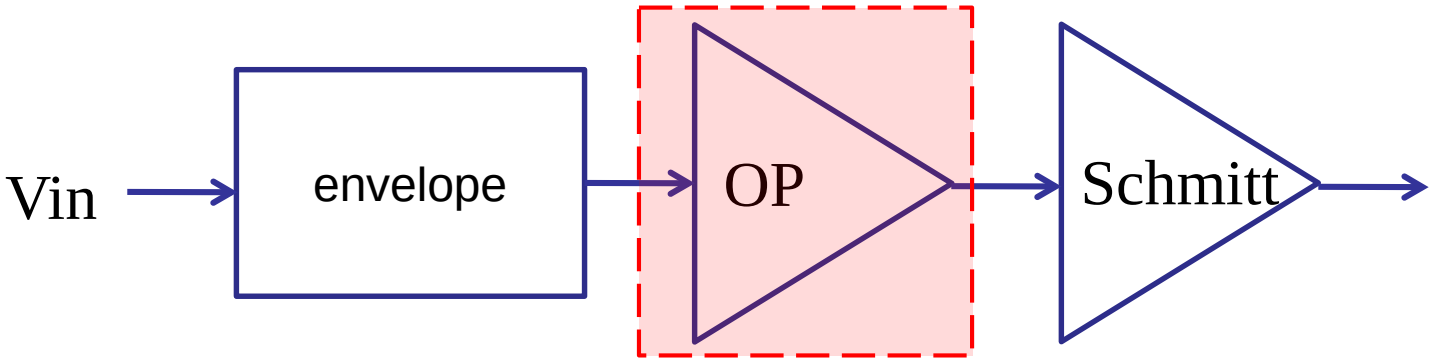
Block Diagram



Block Diagram

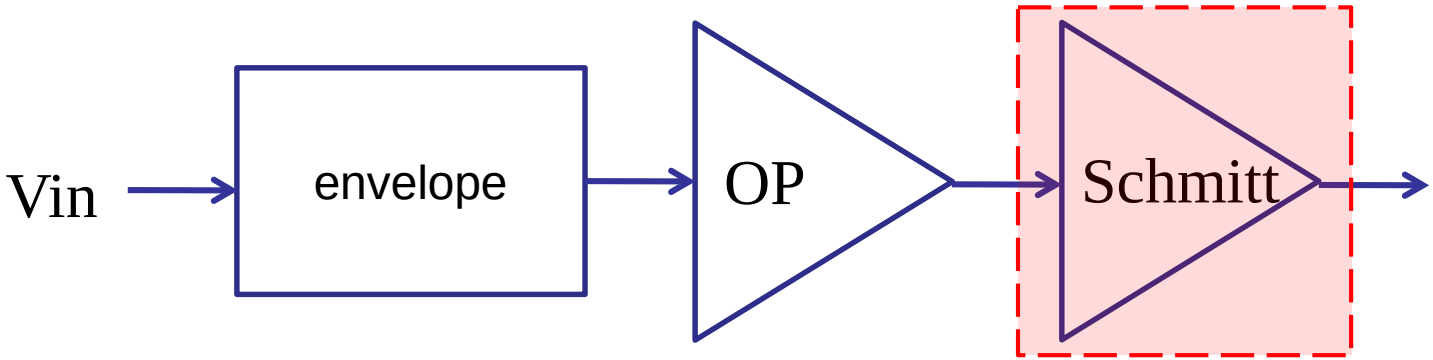
Pseudo-resistor: save the layout area



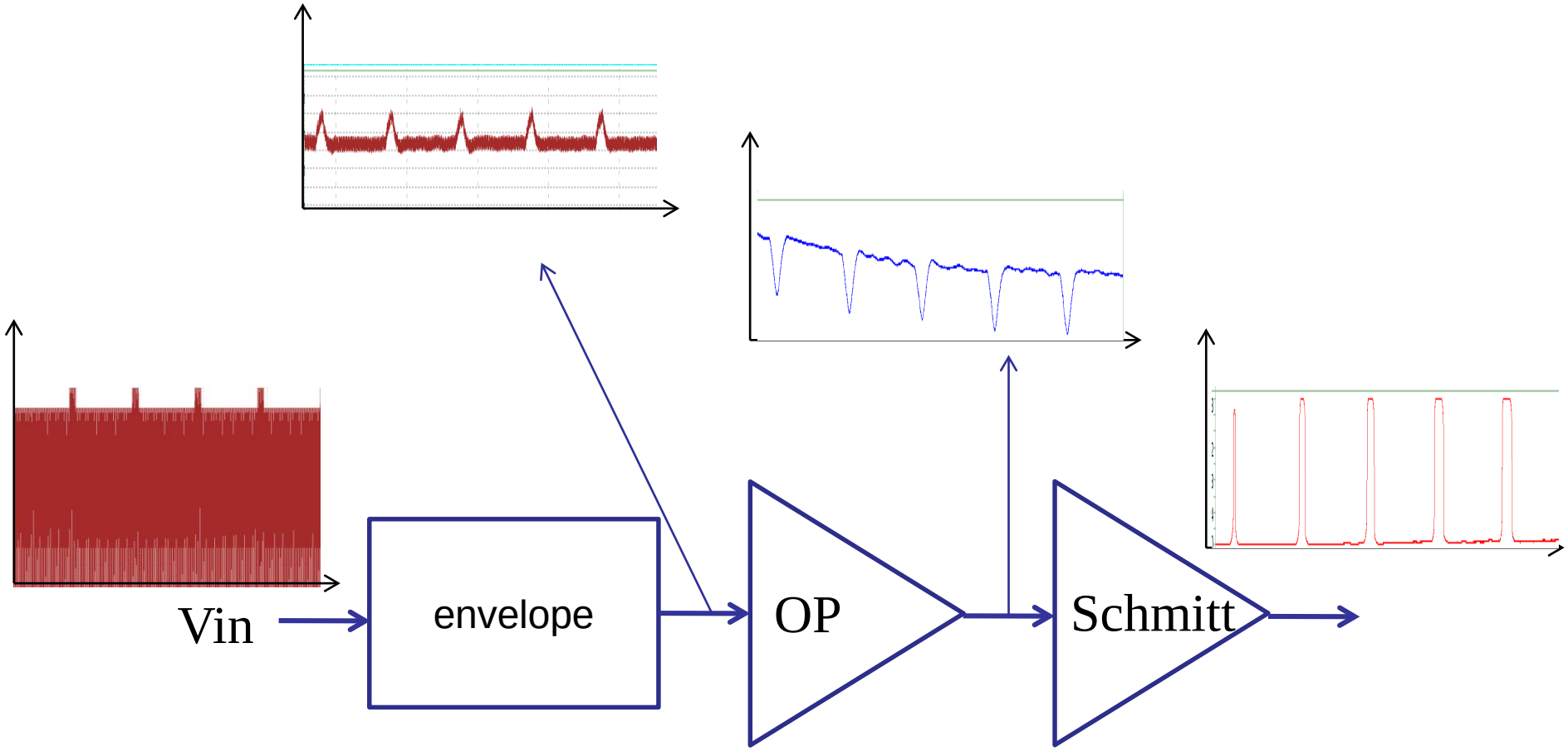


National Chiao Tung University
國立交通大學
ICS Lab.
Nanoelectronics and Gigascale Systems Lab.
奈米電子與晶片系統實驗室
Chu, Hsuan-Hui
祝暄惠

Block Diagram



Simulation Results



National Chiao Tung University
國立交通大學
ICS Lab.
Nanoelectronics and Gigascale Systems Lab.
奈米電子與晶片系統實驗室
Chu, Hsuan-Hui
祝暄惠

Conclusions

- Smaller pulse width method
  - to shorten the data transmitting time which halts the power transmission
- Using pseudo-resistor
  - save the layout area
- Data rate
  - 200kbps (at carrier frequency 13.56MHz)
- Power dissipation
  - 82.247 uW