

---

# A Concept for the Analysis of Cross Sensitivities in Modern RFID Systems



**Fraunhofer** Institut  
Mikroelektronische  
Schaltungen und Systeme

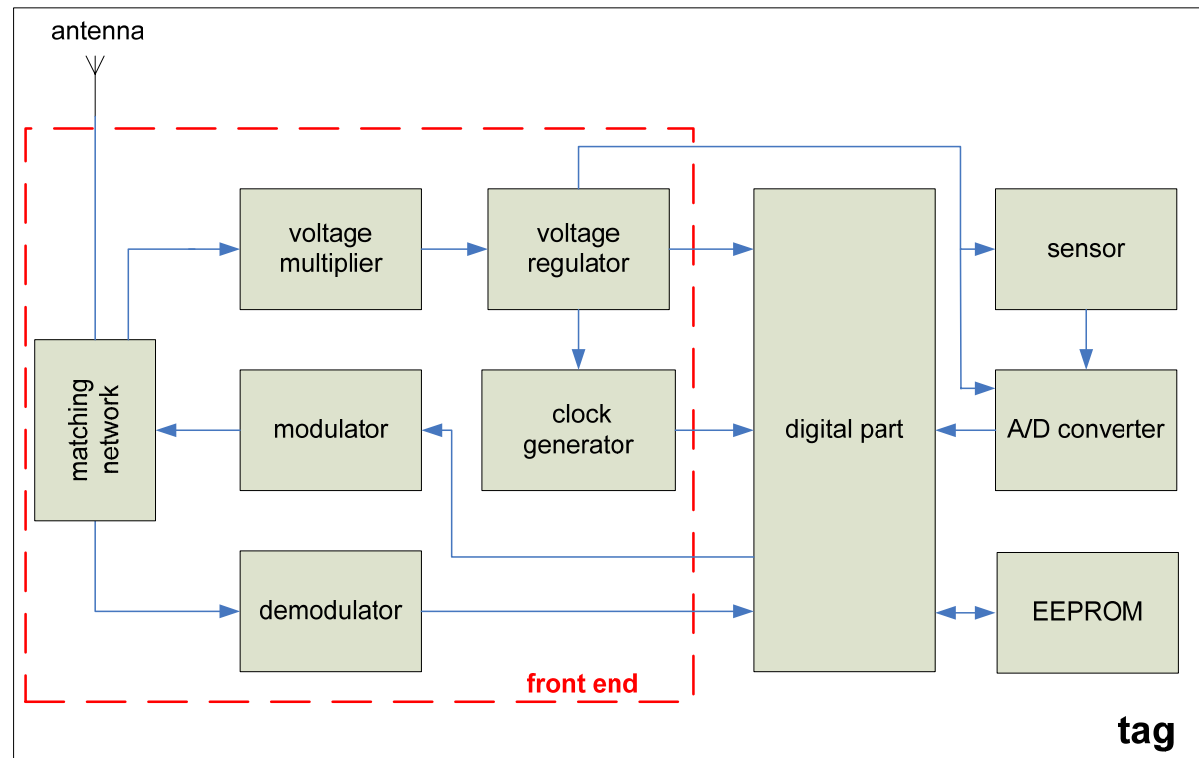
---

Jue Wang

- 
- **Introduction**
  - Cross Sensitivities in RFID Transponder System
  - On Chip Thermal Coupling
  - Conclusion

# Introduction

Architecture of a modern passive transponder system



- 
- Introduction
  - **Cross Sensitivities**
  - On Chip Thermal Coupling
  - Conclusion

# Cross Sensitivities

---

From the outside world

- Temperature Variation
- Mechanical Stress from Package
- Light Radiation
- Electrostatic Discharge (ESD)
- Chemical Materials
- ... ..

# Cross Sensitivities

---

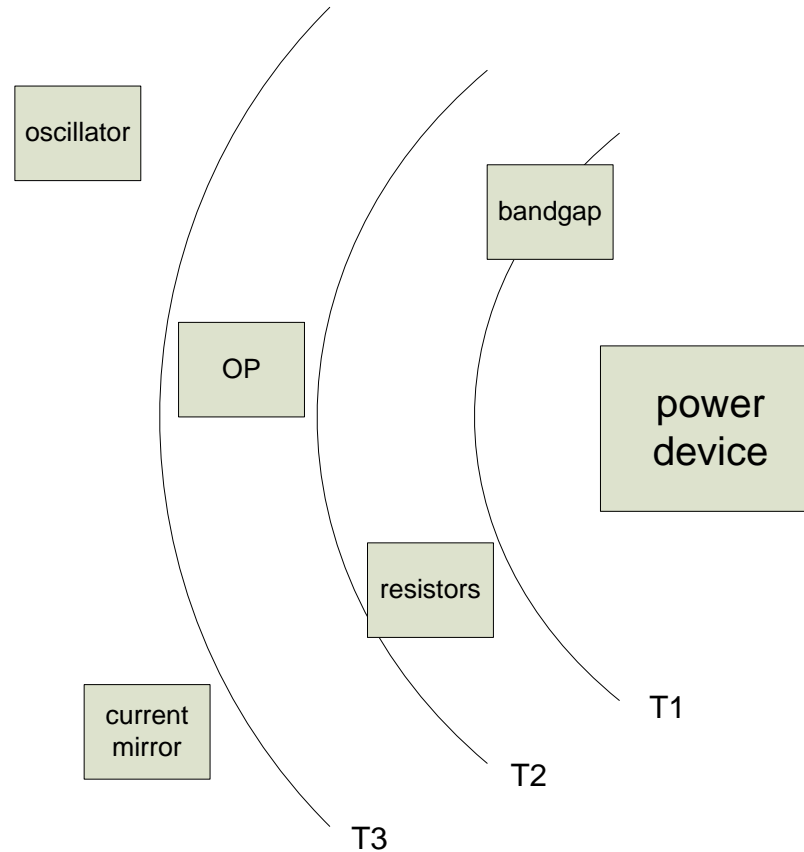
From inside of the chip

- Crosstalk: capacitive coupling, substrate coupling
- Thermal Coupling
- Variation of Supply Voltage
- Latch-Up Effect
- Matching of sensitive components
- Leakage Current
- ... ..

- 
- Introduction
  - Cross Sensitivities
  - **On Chip Thermal Coupling**
  - Conclusion

# Thermal Coupling

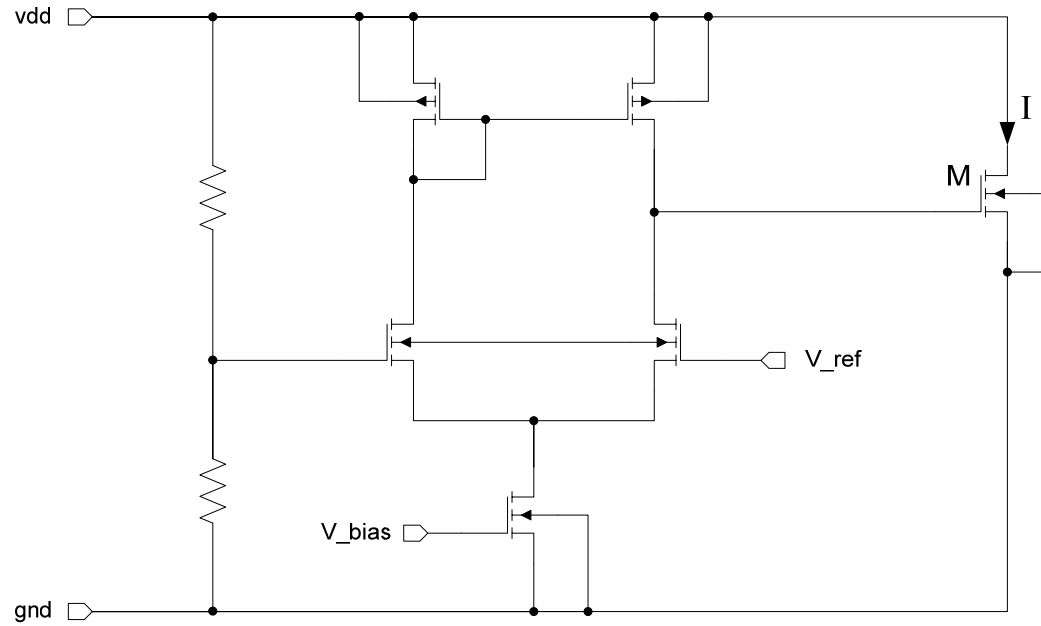
On chip temperature gradient:





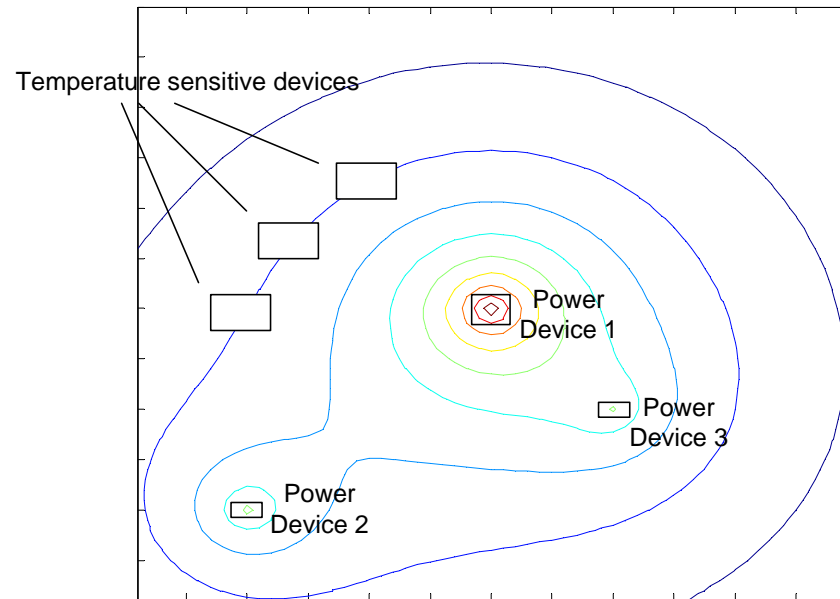
# Thermal Coupling

Heat source on chip:  
voltage protector



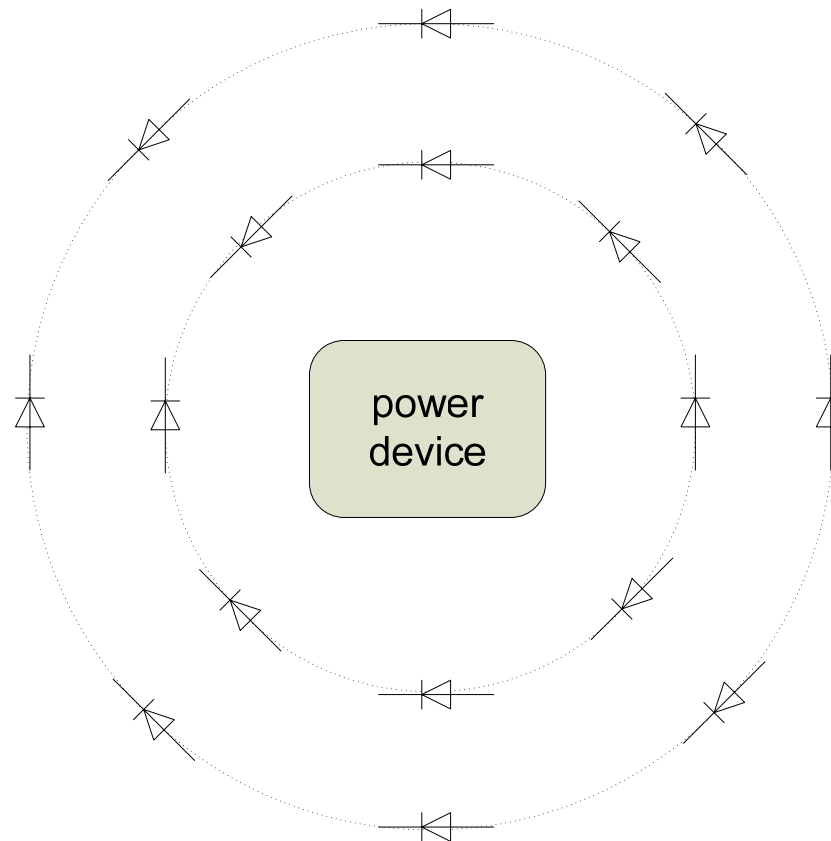
# Thermal Coupling

Temperature distribution  
with more than one heat  
source on chip



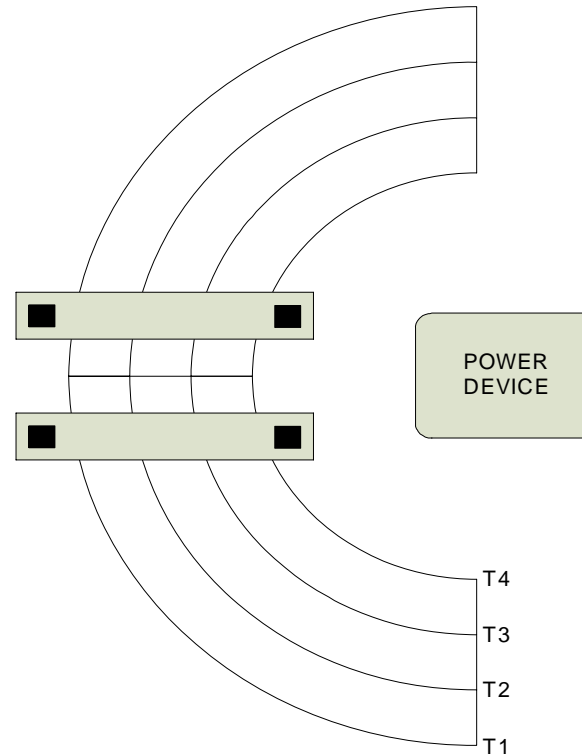
# Thermal Coupling

Measurement of  
temperature gradient



# Thermal Coupling

Approaches to reduce the impact of thermal coupling:



- 
- Introduction
  - Cross Sensitivities
  - On Chip Thermal Coupling
  - **Conclusion**

# Conclusion

---

- Different types of cross sensitivities have been presented.
- Cross sensitivities can be a problem for modern transponder systems, as they are often overlooked during design process.
- System simulation in typical IC design flow does not consider problems such as temperature coupling.
- Approach to the matching, measurement and countermeasures against temperature coupling have been presented.

---

**Thank You !**