Advanced Theory of Integrated Circuits

2 units (selection)

Shinsuke Konaka · Professor / Electrical and Electronic Systems, Electrical and Electronic Engineering, Systems Innovation Engineering

Target〉 To understand the CMOS analog circuit designs for RF-CMOS integrated circuit applications. To understand the logic LSI design by introducing a case study of the previous development of high speed bipolar logic LSIs for a Gb/s optical Tx/Rx and a super-computers.

Outline〉 Main integrated circuit technologies are recently CMOS integrated circuits because of their low power dissipation, low voltage operation and high noise margin. Owing to the continuous scaling down, CMOS operation speed is improved to up to some GHz regions. The purposes of this lecture are to introduce CMOS analog circuit designs and a case study of the previous high speed logic LSIs for multi-Gb/s applications.

Style〉 Lecture and excercise

Keyword*〉 *analog circuits, CMOS, circuit design

Fundamental Lecture〉 "**Advanced Theory of Electron Devices**"(1.0)

Relational Lecture〉 "**Advanced Theory of Electronic Circuits**"(0.7)

Goal〉

1. To understand MOS transistor models and device parameters for CMOS analog circuit design.
2. To understand CMOS single-ended amplifier, differential amplifier and current mirror circuits.
3. To understand high performance LSI designs by reviewing previous development samples of high speed logic LSIs

Schedule〉

1. A review of integrated circuits and basic MOS transistors
2. CMOS process flow and second-order effects of MOS transistor
3. MOS Circuit models and device parameters of MOS transistors
4. Current-voltage characteristics of MOS transistor
5. Common-source single stage MOS amplifier
6. Common-source stage with source degeneration MOS amplifier
7. Designing common-source stage MOS amplifier
8. Common-gate stage MOS amplifier
9. Common-drain stage MOS amplifier
10. Differential MOS amplifier
11. Gilbert cell circuit
12. Current mirror circuit
13. High speed logic LSI using differential circuits (development example)
14. High speed macro-cell array logic LSI (development example)
15. Example of system LSI
16. Examination

Evaluation Criteria〉 Examination is 70% and reports are 30%. The passing score is not less than 60%.

Textbook〉 Design of Analog CMOS Integrated Circuits, Behzad Razavi, McGrow-Hill, ISBN 0-07-118815-0

Contents〉 http://cms.db.tokushima-u.ac.jp/cgi-bin/toURL?EID=216697

Contact〉

⇒ Konaka (E 棟 3 階北 C-2, +81-88-656-7469, konaka@ee.tokushima-u.ac.jp) Mail