**Shanghai IC High Skilled Talent Training Base**

**Shanghai Silicon Intellectual Property Trading Center Co., Ltd**

**IC operational amplifier design and simulation**

**Training and enrollment brochures**

1. Training object
2. Personnel engaged in analog integrated circuit design(including fresh master's graduates).
3. Personnel interested in analog integrated circuit design.
4. Training objectives
5. Master the working principle of CMOS transistor.
6. Master the principle of operational amplifier.
7. Master the methods of stability and frequency compensation.
8. Be able to use EDA circuit design tool to design the schematic diagram and symbols of operational amplifier.
9. Be able to simulate the environment and operational amplifier with circuit design tools;
10. Can analyze the simulation results of operational amplifier.
11. Training features
* Pay attention to the combination of theory and practice, focus on training skills, combine complete basic theory training, and guide the training with reference to international advanced operational amplifier design methods.
1. This paper systematically introduces the working principle of CMOS transistor, the circuit principle of operational amplifier, the frequency analysis method of electronic circuit, the principle of feedback amplifier, the stability and frequency compensation method of amplifier, and the performance parameters of operational amplifier.
2. The schematic diagram and circuit symbols of operational amplifier are established by EDA design tool, and then the performance of operational amplifier is simulated by EDA simulation tool. Combination of theory and practical operation.
3. Training teachers

Paul Fu has 15 years of experience in CMOS analog integrated circuit design. Rich theoretical and practical experience in operational amplifier, LDO, charge pump, bandgap, ADC, MCU, etc. Especially in the direction of operational amplifier, he is proficient in various operational amplifiers, covering almost all fields: low offset operational amplifier, high-speed operational amplifier, high-voltage high-power operational amplifier, Class-D Power amplifier, etc. At the same time, he has team technology management and team leading experience in MCU field.

1. Syllabus

Training unit 1：operational amplifier circuit principle

1、Theoretical teaching content

(1) Operating principle of MOS transistor

(2) Principle of single stage amplifier

(3) Differential amplifier

(4) Current mirror

(5) Frequency response analysis method of electronic circuit

(6) Principle of feedback amplifier

(7) Operational amplifier performance parameters

(8) Noise1.1.8stability and frequency compensation method

Training unit 2：Circuit design of operational amplifier

(1) Design and implementation of folded cascode operational amplifier

(2) Method of stability and frequency compensation

(3) Optimal design and implementation of two-stage operational amplifier system

(4) Layout design considerations of operational amplifier

(5) The motion EDA design tool establishes the circuit schematic diagram and circuit symbols of the operational amplifier

2、Skill training content

(1) System optimization design of folded cascode operational amplifier circuit parameters

(2) System optimization design of circuit parameters of two-stage operational amplifier

(3) Draw the schematic diagram of folded cascode operational amplifier

(4) Drawing operational amplifier circuit symbols

Training unit 3 operational amplifier circuit simulation

1、Theoretical teaching content

(1) Environment setting method

(2) DC analysis and simulation

(3) Transient analysis and simulation

(4) AC analysis and simulation

(5) Noise analysis and simulation

(6) Zero pole simulation

(7) Performance simulation of operational amplifier

(8) monte carlo simulation

(9) Multi process angle simulation

(10) Waveform display window

(11) Results browser

(12) Calculator tools

2、Skill training content

(1) EDA tool environment settings

(2) DC analysis and Simulation of operational amplifier

(3) AC analysis and Simulation of operational amplifier

(4) Transient analysis and Simulation of operational amplifier

(5) Simulation capability of operational amplifier slew rate

(6) Noise analysis and Simulation of operational amplifier

(7) Simulation capability of operational amplifier power rejection ratio

(8) Simulation capability of common mode rejection ratio of operational amplifier

1. Training plan

1. Total online training hours: 24 Theoretical Courses and 56 practical training courses, totaling 80 hours

2. Online course opening form: course platform, course viewing cycle is 3 months, including training account, use time is 1 month, and development board is not provided;

Offline courses: 8 class hours per day for 10 weeks on weekends;

3. Opening time: online courses are open at any time, unlimited number of people; Offline courses began to recruit students, and classes were full

1. Contact information

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\*Please refer to the Chinese version for the contents of enrollment brochures!

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