1. Introduction

Cost and Quality for Test Cost

- Analog portion continues to be difficult part of SoC test.
- Concept of “cost” and “quality” makes more clear and logical.
- LSI testing technology reduces cost and improves quality simultaneously.

1.1 Test and Measurement
- Production Test: 100% Engineering
- Soldering: Yes/No
- Example: IT quality comparison between DUT and Golden Device.
- LSI testing is manufacturing engineering.
- Measurement: 90% Science, 50% Engineering

1.2 Analog BIST
- BIST for analog: Successful BIST for analog.
- Very short test time.
- Challenging research.
- Digital test: Functionality & Quality
- Analog test: Functionality & Quality
- Accurate test evaluation of circuit.
- Measurement can be costly, but testing should be at low cost.

Test and Measurement are different

- Production Test: 100% Engineering
- Soldering: Yes/No
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2. Review of Analog Circuit Testing in Mixed-Signal SoC

Management Strategy

- Strategy 1: Low cost test ATE and develop analog BIST/BIST to make testing cost lower.
- Strategy 2: Use high-end mixed-signal ATE as well as its associated services, and know how.
- Fast time-to-market, but no BIST can make profits much more than testing cost.

- Low Cost Testing
- No testing
- Design guarantee
- 100% chip works well
- Reliability
- Low cost ATE
- Short testing time
- Multi-site testing
- Minimum or no chip area penalty for BIST
- Extensive usage of BOST

- Robust Design and Testing
- Robust design makes its testing difficult.
- Feedback suppresses parameter variation effects.
- Self-calibration and redundancy
- Design for testability in DUT.
- Secure DUT is difficult to test.

- Low Cost Design and Testing
- Low cost enhancement and testing cost reduction are made.

2.1 Test and Measurement
- Production Test: 100% Engineering
- Soldering: Yes/No
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2.2 Analog BIST
- BIST for analog: Successful BIST for analog.
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- Analog test: Functionality & Quality
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3. Research Topics

- ATE for Mixed-Signal Testing
- Analog part is cost for development.
- Analog BIST is also beneficial for mixed-signal ATE manufacturer.
- ATE must be designed with today’s technology for tomorrow’s higher performance chip.

- Low Cost ATE
- Digital ATE
- No analog option such as
- Arbitrary Waveform Generator: AWG
- Input/ouput: mainlly digital.
- Replacement of analog ATE with digital ATE
- Multi-site testing becomes possible.
- The short test time is important.
- Secondhand ATE, in-house ATE
- ATE with well balanced modular hardware and software.

- RF / High-Speed IO / Power Device Testing
- RF / HSIO / Power Device testing is different from analog testing technology.
- These testing technologies are rather differing areas.
- RF testing items examples:
- EVM test
- System level testing: GSMBEST
- AMP/MPR: Interconnection
- Power, Phase noise

3.1 Test and Measurement
- Production Test: 100% Engineering
- Soldering: Yes/No
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- LSI testing is manufacturing engineering.
- Measurement: 90% Science, 50% Engineering

3.2 Analog BIST
- BIST for analog: Successful BIST for analog.
- Very short test time.
- Challenging research.
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- Analog test: Functionality & Quality
- Accurate test evaluation of circuit.
- Measurement can be costly, but testing should be at low cost.

4. Challenges & Conclusion

- Challenges of Analog Testing
- Use all aspects of technologies
- Device testing
- Cooperation among BIST, BOST & ATE
- Test as software and hardware
- Signal processing algorithms
- Use resources in SOC
- Use all technologies

- Complex Multi-Bandpass ΔΣ Modulator for I-Q Signal Generation
- Complex Multi-Bandpass ΔΣ Modulator for I-Q Signal Generation
- Challenges of Analog Testing
- No royal road to analog testing.