How to write a good Journal of Solid State Circuits paper

Bram Nauta
JSSC Editor in Chief
University of Twente, The Netherlands
b.nauta@utwente.nl
http://icd.ewi.utwente.nl

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Outline

• About the Journal
  – Yesterday and today
  – Journal versus Conference
  – Organization of the Journal
  – What kind of papers?

• Writing tips
  – Paper outline
  – General tips

• How NOT to write a JSSC paper
Outline

• **About the Journal**
  – Yesterday and today
  – Journal versus Conference
  – Organization of the Journal
  – What kind of papers?

• **Writing tips**
  – Paper outline
  – General tips

• **How NOT to write a JSSC paper**
History

- Established in 1966
  - 4 issues per year
- Volume 1, nr 1: ISSCC 1966 issue
- Purpose = archive
The Nr 1 IEEE Journal
By far: most downloaded IEEE Journal
By far: most cited in all US Patents
   – Over all technical disciplines
References in patents from top 25 companies to top 20 publishers

IEEE cited 4x more than nearest competitor

[Bar chart showing references of top 25 companies to top 20 publishers with IEEE leading significantly]
## Top cited IEEE Journals in patents

<table>
<thead>
<tr>
<th>Rank</th>
<th>Title</th>
<th>Cites</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IEEE Journal of Solid-State Circuits</td>
<td>14,765</td>
</tr>
<tr>
<td>2</td>
<td>IEEE Transactions on Electron Devices</td>
<td>8,824</td>
</tr>
<tr>
<td>3</td>
<td>IEEE Transactions on Communications</td>
<td>8,678</td>
</tr>
<tr>
<td>4</td>
<td>IEEE Photonics Technology Letters</td>
<td>8,383</td>
</tr>
<tr>
<td>5</td>
<td>Journal of Lightwave Technology</td>
<td>5,989</td>
</tr>
<tr>
<td>6</td>
<td>Proceedings of the IEEE</td>
<td>5,338</td>
</tr>
<tr>
<td>7</td>
<td>IEEE Transactions on Magnetics</td>
<td>5,071</td>
</tr>
<tr>
<td>8</td>
<td>IEEE Transactions on Computing</td>
<td>4,393</td>
</tr>
<tr>
<td>9</td>
<td>IEEE J on Selected Areas in Communications</td>
<td>4,148</td>
</tr>
</tbody>
</table>
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  – Yesterday and today
  – *Journal versus Conference*
  – Organization of the Journal
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• How NOT to write a JSSC paper
Conferences

• Fast publication
• Usually a smaller idea
  – Benchmark: Known circuit in new technology
  – Smaller trick can be o.k.
  – depends on conference
• Just accept or reject; no rewrite
  – It may be incomplete
  – It may lack key references
• Good for networking and Q&A
• SSCS conferences are available on IEEExplore
Journal publication

• Academic reputation
  – Journals can have more status than conferences
    • Depends on the field
• Reviewed Journal gives a “quality stamp”
  – Reviewers demand corrections & clarifications
• Archive your work
  – Wider scope
  – More theory
  – More technical information
  – More Educational
  – More references
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• How NOT to write a JSSC paper
Organization regular JSSC papers

Editor

Associate Editor

Reviewers

Author
Associate Editors

- Baas, Bevan
- Behzad, Arya
- Flynn, Michael
- Gharpurey, Ranjit
- Gillingham, Peter
- Halonen, Kari
- Karanikolas, Andrew
- Kim, Beomsup,
- Leenaerts, Domine
- Liu, Shen-luan,
- Mok, Philip
- Nairn David
- Natarajan Shreedhar
- Rusu, Stefan
- Razavi, Behzad,
- Savoj, Jafar
- Shaeffer, Derek
- Shepard, ken
- Young, Darrin
Special Issues on conferences

- December  ISSCC-analog, RF  (issue)
- January  ISSCC-dig+rest   (issue)
- April     VLSI           (issue)
- May       RFIC           (section)
- July      ESSCIRC        (issue)
- August    CICC           (issue)
- September BCTM          (section)
- October   CSIC           (section)
- November  A-SSC          (section)
Organization special Issue

- Editor
- Guest Editor
- Author
- Associate Editor
- Reviewers
Procedure (regular papers)

• Author submits manuscript to Editor
• Editor sends to Associate editor
• Associate Editor sends to reviewers
• Associate Editor makes decision:
  – AWR accept with revisions 😊
  – REJ reject
  – REF refer to other Journal

It's not a democratic process!!!!!!!!!!!!!
Procedure (regular papers)

- Author rewrites
  - Give list of how you changed manuscript based on reviewers comments
  - Do not reply to reviewer but change your manuscript
- Associate Editor makes final decision
- OR: Associate Editor organizes second review
- Author submits final package to Associate Editor
- Associate Editor inspects and forwards to Editor
- Editor compiles issues and sends to IEEE
Time schedule (regular papers)

• Delay to first decision  ~100 days
• Delay author rewrite      ~100 days
• Publication delay        ~140 days
• Total delay              ~340 days
Origin of regular papers

• 365 submissions/year: 1/day
  – Asia 40% (Taiwanese Universities)
  – USA 25%
  – EU 25%
  – ROW 10%

• Same regional distribution as ISSCC
• 90% is analog/RF!!
Accept/reject regular papers

- Accept 36%
- Reject 58%
- Refer to other Journal 3%
- Withdrawn 3%

Main reject reasons:
- Not enough novelty/innovation
- Not enough news w.r.t. prepublication
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What papers are good for JSSC?

• IC Implementation oriented
  – Not: microwave PCP/ modeling/ device only
• Not too much theory (Better use TCAS)
• Integrated Circuit needed
• But to have an IC is not enough!

The work must be of HIGH Quality
What is high quality?

• Must describe an **INNOVATIVE IDEA**
  – Not just a permutation
  – Not a known circuit in new technology
  – Not a combination of known techniques
  – But a real new concept / invention

• **AND** idea must be proven on IC

• **AND** idea must significantly advance state-of-art
Prepublication

• ~90% of submitted papers have prepublication at conference(s)
  – That’s ok

• Conferences are available on IEEEExplore

• So a JSSCC paper should add significant information to the prepublications
Prepublication policy

• “A JSSCC paper should be worth reading for a person who has read the conference paper.”
  – Better description of state-of-art
  – More theory + proof of concept
  – More measurements
  – More discussion (mismatch, no-idealities etc)
  – More benchmark, more discussion
  – More references
Prepublication policy

• NOT each conference paper deserves to be a JSSC paper
• NOR each work without prepublication deserves to be a JSSC paper

• It’s a delicate thing, but all about QUALITY
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A Typical paper outline

• Title
• Abstract
• Introduction
• Body
• Experimental results
• Discussion
• Conclusion
• references
The Title

• Must describe the paper
• Not too vague
  – “A novel receiver”
    • Do not use “novel” anyway
  – “5-GHz RF Frontends for Ultra-Low-Voltage and Ultra-Low-Power Operations”
    • How much is Ultra?
• But exactly what is really new:
  – “Noise canceling technique for wideband receivers”
• Or exactly what is achieved
  – “A 1.5GHz 1.3dB NF, 10mW down converter in 65nm CMOS for GPS applications”
• Or both!
Abstract

- 1 paragraph
- Exactly what paper is about
- Can have overlap with conclusions
- Keywords, indexing terms
  - Use many!!
  - So your paper can be found
  - You will be cited a lot
Introduction

• Describe the problem you solve
  – Open the subject
  – Zoom in step by step
  – Describe your assumptions
  – Each step is one paragraph

• Describe the state-of-art
  – Use plenty of references

• Tell basic your idea
  – This motivates the reader to continue
  – Cite your prepublications and tell the difference

• Give outline
The body

• Explain your key idea

• Build up Step by step
  – One thinking step at the time
  – Each step is one paragraph

• Proof that it makes sense
  – Use mathematics
  – Give exactly your boundary conditions
  – Give results in comprehensive way
The body

• Be self-critical and realistic:
  – does it really make sense?

• E.g. for a linearity improvement technique:
  – If power dissipation is larger
  – And noise is also larger
  – And you know that $P \sim \text{SNR}$: does this make sense?

• Is it just the technology or your smartness?
  – E.g. speed $\sim f_T$ or $f_{\text{max}}$

• Are practical boundary conditions met?
  – VCO @ high frequency but $P_{\text{out}} = -30\text{dBm}$
Experimental Results

• Describe exactly what has been measured and how.
  – Describe setup
  – “Bio Biased”? (manual tweaking and tuning)
  – Probe or PCB?
  – What equipment?
  – How many samples?
  – PVT?
  – Batch to batch spread?

• Experiment must be repeatable and of practical use (e.g. for industry)
Experimental Results

• Compare with theory / simulations
• Does it prove your idea and theory?
• Always tell if a result is measures. Simulated or calculated.

“Figure x shows the noisefigure versus frequency”

is this measured? Simulated? Calculated? Estimated?
IC realization

• Give chip photograph
  – Dimensions
  – What is what

• Give technology + options
Discuss results

• Compare to state-of-art in fair way
  – Show all relevant data + papers
  – A table can help
    • although measurements are hard to compare

• Use common FoM definitions
  – ADC, VCO, filter

• Be careful to define your own FoM
  – Do not misuse FoM for showing off
  – Power ~ SNR. BW makes sense
  – Power/bondpad is NOT a good FoM!!
Discuss results

• Help the reader to interpret the results
• Absolute accuracy needed?
  – show many samples, proof batch to batch robustness
• Matching needed?
  – show many samples
• Calibrated circuits?
  – describe what input signal is used/required. When does it go wrong? How realistic is it?
Discuss Results:

A useless PLL benchmark:

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Unit</th>
<th>This Work</th>
<th>[6]</th>
<th>[13]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td></td>
<td>0.18-μm CMOS</td>
<td>0.18-μm CMOS</td>
<td>0.25-μm SiGe</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>BiCMOS</td>
</tr>
<tr>
<td>Frequency</td>
<td>GHz</td>
<td>10.3</td>
<td>10.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Supply Voltage</td>
<td>V</td>
<td>1.8</td>
<td>1.8</td>
<td>3.3</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>mW</td>
<td>113</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Locking Range</td>
<td>GHz</td>
<td>10.1 ~ 11</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Peak-to-Peak Jitter</td>
<td>ps</td>
<td>3.72</td>
<td>6.5</td>
<td>4.8</td>
</tr>
<tr>
<td>RMS Jitter</td>
<td>ps</td>
<td>0.43</td>
<td>0.6</td>
<td>0.4</td>
</tr>
</tbody>
</table>
Conclusions

• Start writing with this
• First make a bullet list for yourself
  – A hand full of bullets
  – So you know where to write towards
  – This gives your paper focus
• Conclusion should be readable without reading the whole paper
• Convince the reader

What did we learn?
References

• Include latest state of the art
  – For benchmark

• But also refer to the original papers
  – Go back in time!
  – Most references are younger than 5 years 😞
  – While most ideas are much older!

• Textbooks are useful too
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Writing tips:

A well written paper gives the impression of a good idea
Writing Tips

• If a paper is too complex:
  – Reviewers don't understand it
  – Reviewers don’t believe it
  – Reviewers will not like it

• If a paper is too simplistic
  – Reviewers think its nothing special
  – Even if the results are good
General writing tips

• Make your problem relevant
• Start with the “big picture”
• Take the reader by the hand
  – Step by step explanation
• Highlight innovation
• Do not give too many equations
• Do not give too much theoretical details
• Do not try to make a tutorial
General writing tips

• Do not use “very” but give the numbers
• Avoid to use “novel”
  – everything you don´t cite should be novel
• Use short sentences
• Use simple words
• One point per paragraph
  – First or last sentence is most important
  – The rest is explanation
General writing tips

• If you are stuck:
  – Tell a friend what you did.
  – Use the words & slides like on your conference paper
  – Polish the text later

• Let a fellow student read & comment

• Ask native speaker to correct language

• Polish, Polish, Polish
  – Reviewers hate mistakes!!
  – It iz raely anojjing to raed tekst width misstakes
Figures

• Make the figures like a cartoon
  – Reader can understand idea by looking at figures + caption only

• Spend a lot of time to make good figures
  – Papers with bad figures almost always get rejected
Figures

- Must be readable in single column:
- Not good:

Figure 13
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Do NOT

• Publish the same material elsewhere
  – Reviewers+readers always see this; its unethical

• Change your paper after acceptance and before publication
  – E.g. remove reference to competitor
  – Reviewers always see this

• Use someone else’s ideas
  – “Someone else” is reading too

• Hide “unpleasant” measurements
Do NOT

- Fabricate or falsify results
  - Not tune bias for each measuring point
  - Not make few chips and measure different parameters on different chips
  - Or even completely falsify results
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Summary

• IEEE Journal of Solid-State Circuit
  – Most downloaded, most cited in patents
• Needs an Innovative new idea
  – Working silicon is not enough
  – Must improve state-of-art
• Needs new material after prepublication
• Reviewers are demanding
• Your writing technique can help