

CALL FOR PAPERS

IEEE Journal on Exploratory Solid-State Computational Devices and Circuits

Special Topic on Tunneling FETs for Energy-Efficient Computing & Information Processing

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Aims and Scope:

The Tunneling Field-Effect Transistor (T-FET) is considered a future transistor option due to its steep-slope prospects and the resulting advantages in operating at low supply voltage (V_{DD}).

Reducing supply voltage (V_{DD}) while keeping a low leakage current and a reasonably high on-current is critical for minimizing energy consumption and improving the energy efficiency of computing and information processing. The thermal limit (*Boltzmann's Tyranny*) of the MOSFET transistor subthreshold swing (SS) restricts lowering its threshold voltage (V_t), causing significant performance degradation at low V_{DD} . A Tunneling Field Effect Transistor's (T-FET) SS is not limited by this thermal tail and may perform better at low V_{DD} .

Since the first experimental proof of subthreshold swing ($SS < 60\text{mV/dec}$), T-FET's prospects have attracted the interest of researchers. Silicon's large indirect bandgap and large carrier mass prevents Si T-FET from achieving high drive currents. But due to the availability of high-quality material together with years of know-how, Si and Si/Ge T-FETs have been studied initially, and showed the first of many devices with $SS < 60\text{mV/dec}$. III-V materials for T-FETs attracted attention next because of their low bandgap and carrier mass. While more challenging to fabricate, the broken bandgap hetero-junctions III-V T-FETs eventually showed the highest T-FET drive-current. Beyond III-V materials, Transition Metal Dichalcogenide and other 2D materials may provide a path in the future to high performance energy efficient transistors, thanks to thinner channels enabling better control of the tunneling field.

This call for papers on Tunneling FETs is for rapid publication of seminal results across the areas of T-FET materials, devices, and circuits for novel computation and information processing paradigms. Paper submissions with key insights into the advantages and challenges of specific T-FET device and material designs and circuit techniques are especially valued in order to guide the semiconductor industry and academia on a path toward more energy-efficient computing.

Topics of Interest:

Special Topic on Tunneling Field Effect Transistors (Tunneling FETs, T-FETs)

- N- and P- Tunneling FET experimental transistors demonstrating high performance at low supply voltage

- T-FET material and device design, including hetero-junction III-V materials, transition metal dichalcogenides, other two-dimensional materials and their hetero-junctions
- T-FET circuits for energy efficient computing and information processing
- Energy-Efficient computing and information processing with T-FET transistor circuits and architectures.

Important Dates

Open for Submission: April 15th, 2020

Submission Deadline: June 30th, 2020

First Notification: August 1st, 2020

Revision Submission: August 21st, 2020

Final Decision: September 30th, 2020

Publication Online: December 1st, 2020

Submission Guidelines

The IEEE Journal on Exploratory Solid-State Computational Devices and Circuits (JxCDC) IS AN OPEN ACCESS ONLY PUBLICATION:

Charge for Authors: \$1,350 USD per paper. Paper submissions must be done through the ScholarOne Manuscripts website: <https://mc.manuscriptcentral.com/jxcdc>

Guidelines for papers and supplementary materials, as well as a paper template, are provided at this [website](#).

Inquiries for the JxCDC Journal should be sent to: JXCDC@IEEE.ORG

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PAPER FORMAT DESCRIPTION:

Papers can have 2 parts – the first part is a 4-8 page main paper (following a strict format – template available from website), and the second part is the supplementary material. The main paper itself will just focus on describing why the work is important, the state of the prior art, the key new accomplishment(s) or results, and then what the research directions are going forward. The main paper can have an accompanying supplementary material (detailed methods) part. The supplementary material is not mandatory, but authors are strongly encouraged to submit supplementary material, which will increase the chance of acceptance. The Supplementary material (detailed methods) will be peer reviewed along with the main paper.

Style guidelines for the main paper:

The main report (min. of 4, max. of 8) is written in format of a letter. Due to their letter nature, the research must be original and must be of interest to research scientists/engineers and industry in related fields.

Abstract guidelines: The report begins with a fully referenced paragraph, ideally 200 words aimed at readers in the general area of engineering and physical sciences. The references must be up-to-date (e.g. referring to the best available materials, devices, circuits) & convey the relevance and originality of the research. This paragraph starts with a 3-4 sentence basic introduction to the problem area explaining the relevance and the issues. This is followed by a one-sentence statement of the main conclusions (e.g. 'Here we show' or equivalent phrase); and finally, 2-3 sentences putting the main findings into general context so it is clear how the results described in the paper have moved the field forwards.

Body: The text of the article must be succinct and start with general audience and progressively increase the complexity for experts. The body of the main paper must provide clear context to the present work based on established industry roadmaps, figures of merit or generally accredited framework (computational throughputs, leakage power, long form Reviews of Modern physics, IEEE proceedings, Nobel lectures). To enable the comparison, it is encouraged that key quantitative findings of the paper are compared in a table with current references. Any concluding statements at the end of the article must be short since key conclusion is clearly articulated at the introduction. A repetition of the conclusions in the abstract should be avoided. Concluding statements explaining future possibilities or evolution are encouraged.

Style guidelines for supplementary material (methods paper):

The supplementary material is a unique format to encourage complete and clear communication of the relevant information to the experts in the area, while providing a citable source for the students for the innovations in scientific method: processing, modeling and theory. Long form derivations and code submissions are encouraged for theoretical and modeling papers. Modeling papers could for example provide all relevant data (not necessarily the code but they could) required to reproduce or validate the results. The JxCDC encourages the authors to put the experimental details such as fabrication methods, detailed characterizations, models or simulation methods (if it is a theory paper). The supplementary information therefore documents innovations in the experimental and modeling scientific methods, e.g. an innovative process technique to avoid interface effects, newly adopted differential equation solvers or innovative developments in device/circuit analysis can be included (and students/researchers will have a citable source online). Background materials that help the reader can be referenced in the supplemental material.

The supplementary material part begins with an unreferenced abstract (typically 150 words) and is divided into separate sections for introduction, results, discussion and methods. Introduction and discussion are brief and focused. The results section usually contains a general description followed by their validation. The methods section provides technical details necessary for the independent validation of the methodology, without referring to a chain of bibliographical references. The text of the supplementary material (excluding abstract, methods, references and figure legends) is limited to 6000 – 7000 words. Articles have no more than 12 display items

(figures and tables). The results and methods should be divided by topical subheadings; the discussion may contain subheadings at the author's discretion. If statistical testing was used to analyze the data, the methods section can contain a subsection on statistical analysis. If significant EDA tools are employed, relevant validation can be provided for the novel approach. The experimental tools and the instrumentation used must be explained in a clear schematic preferably with the models (part numbers) mentioned.

In summary, all the new contributions and accomplishments are to be summarized in the 4-8 page main paper. The main paper format will be such that it can be understood by not only the expert but also the non-expert (providing the context to someone unfamiliar but wanting to follow progress in the field). All experimental or simulation methods to enable reproducing/validating the results of the paper are in the supplementary material (detailed methods) part.