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A Novel Mode of Current Switching Dependent on Activated Charge Transport

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Abstract content
 (Max 300 words)

We demonstrate a fully printed transistor with a planar triode geometry, using nanoparticulate silicon as the semiconductor material, which has a unique mode of operation as an electrically controlled two-way (double throw) switch. A signal applied to the base changes the direction of the current from between the collector and base to between the base and emitter. We further show that the switching characteristic results from the activated charge transport in the semiconductor material, and that it is independent of the dominant carrier type in the semiconductor and the nature of the junction between the semiconductor and the three contacts. The same equivalent circuit, and hence similar device characteristics, can be produced using any other material combination with non-linear current-voltage characteristics, such as a suitable combination of semiconducting and conducting materials, such that a Schottky junction is present at all three contacts.

We present performance results for two design variants of the printed transistor and confirm our interpretation of the device's operation by constructing a model circuit using individual varistors.

Apply to be
 considered for a student
 award (Yes / No)?

Yes

Level for award
 (Hons, MSc,
 PhD)?

PhD

Main supervisor (name and email)
and his / her institution

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Would you like to
 submit a short paper
 for the Conference
 Proceedings (Yes / No)?

Yes

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