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# Field Effect Bipolar Transistor

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## ABSTRACT

Researchers at the University of California have developed a field effect bipolar transistor (FEBT) on a unilateral silicon substrate using CMOS/BiCMOS technology for use in switching and amplification of electric signals and as a 1-transistor memory cell for storing information in a suitable circuit.

## FULL DESCRIPTION

Transistors are semiconductor circuit elements used to control electron flow. They are often used as amplifiers and switches in electronic circuits due to their small size and low power consumption. As a result of their ubiquity in electronic devices, improvements made to the functionality of transistors can also improve electronics in general.

Researchers at the University of California have developed a field effect bipolar transistor (FEBT) on a unilateral silicon substrate that is fully compatible with BiCMOS/CMOS technology. The FEBT has current-controlled negative differential resistance, zero subthreshold swing between On/Off states at switching point (<1mV/dec), zero dynamic power consumption with above 60 dB on/off contrast, adjustable hysteresis with field effect channel charge modulation using gates, and negative transconductance steady state characteristics. The FEBT can be used independently or fully integrated with BiCMOS/CMOS technology and is suitable for static and memory structures, logic gates, on-chip ESD protection, amps, power amps, oscillators, charge pump, switches, duplexes, mixers, variable attenuation and high current devices. The FEBT provides multiple features in a single, compact, low-cost structure with zero added cost to the current semiconductor integrated circuit technology for low power, fast analog, digital, and mixed signal designs.

## APPLICATIONS

- ▶ Ultrafast processors
- ▶ FPGA
- ▶ Logic design
- ▶ High capacity SRAM and DRAM designs with no extra circuitry for read/write control
- ▶ Zero-loss switches
- ▶ On-chip, efficient power amplifier
- ▶ Satellite, Radar and telecommunication technology with ultra wideband requirements

## FEATURES/BENEFITS

- ▶ Simple, low-cost and compact design
- ▶ Compatible with CMOS/BiCMOS
- ▶ Requires no additional cost for integrated circuit design or integration with other electronic designs
- ▶ Requires little to no change in circuitry for integration depending on desired functionality of FEBT

## PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Published Application	<a href="#">2021-031345</a>	10/07/2021	2018-819
Patent Cooperation Treaty	Published Application	<a href="#">2020/037241</a>	02/20/2020	2018-819

## CONTACT

Michael M. Mueller  
[mmueller@ucdavis.edu](mailto:mmueller@ucdavis.edu)  
tel: .



## INVENTORS

- ▶ Liu, Xiaoguang
- ▶ Momeni, Omeed
- ▶ Sohrabi, Mohammad-Hadi

## OTHER INFORMATION

### KEYWORDS

field effect bipolar transistor, FEBT, MOSFET, BJT, TFET, ultra wideband RF Switch, ultra fast low noise switch for data centers, ultrafast D-latch, low power processor, ultra dense D-RAM

### CATEGORIZED AS

- ▶ **Communications**
  - ▶ Other
- ▶ **Computer**
  - ▶ Hardware
- ▶ **Engineering**
  - ▶ Engineering

### RELATED CASES

2018-819-0

## ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- ▶ [Abnormal Heart Activity Monitoring Using Contact Doppler Radar](#)
- ▶ [Ultra-High Range Resolution Doppler Radar Front End With Quadrature-Less Coherent Demodulation](#)
- ▶ [Portable Heart Motion Monitor](#)

- ▶ On-Chip Platform for Single-Molecule Electrical Conductance Measurements
- ▶ Using Contact Doppler Radar to Monitor PA Pressure in Heart Failure Patients
- ▶ Absorptive Microwave Bandpass Filters
- ▶ Quarter-Rate Serial Link Receiver with Low Aperture Delay Samplers for High Data Rate Applications
- ▶ Low Energy and Noise Sub-Sampling Phase-Locked Loop
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**University of California, Davis**

**Technology Transfer Office**

1850 Research Park Drive, Suite 100, ,  
Davis, CA 95618

Tel: 530.754.8649

[techtransfer@ucdavis.edu](mailto:techtransfer@ucdavis.edu)

<https://research.ucdavis.edu/technology-transfer/>

Fax: 530.754.7620

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