

Field Effect Bipolar Transistor

Tech ID: 29804 / UC Case 2018-819-0

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 ($<1\text{mV/dec}$), 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	2021-031345	10/07/2021	2018-819
Patent Cooperation Treaty	Published Application	2020/037241	02/20/2020	2018-819

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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**
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