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	Issued Patent	12,324,172	06/03/2025	2018-819

INVENTORS

- Liu, Xiaoguang
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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**
  - Other
- **Computer**
  - Hardware
- **Engineering**
  - Engineering

RELATED CASES

2018-819-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Reversed Feedback Amplifier Architecture
- 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
- A Novel High-Qu Octave-Tunable Resonator And Filter With Lumped Tuning Elements
- High-Frequency Imaging and Data Transmission Using a Re-configurable Array Source with Directive Beam Steering
- Hybrid Electromechanical Metamaterials for Optical and Electrical Devices
- Phased-Locked Loop Coupled Array for Phased Array Applications
- Scalable Phased Array Standing Wave Architecture
- Embedded Power Amplifier
- Reducing Electrical Current Variations in Phase-Locked Loop Systems

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