

Superjunction Collector Bipolar Transistors (#4797)

Design for vertical high-speed bipolar transistor

Georgia Tech inventors have developed a design for a vertical high-speed bipolar transistor incorporating superjunction collector designs. A superjunction collector can be utilized to significantly improve avalanche breakdown behavior of SiGe high-speed bi-polar transistors with little or no impact on device speed. This superjunction collector device design is applied in a high-speed silicon-germanium heterojunction bipolar transistor, and significant improvement has been demonstrated in the device speed and breakdown performance.

Benefits/Advantages

- **Higher breakdown voltages** — higher breakdown voltages with no performance degradation
- **Improved design**- involving super junction collector features
- **Scalable**- operable at room temperature and voltage ranges from 1V to 20V
- **Easily implementable**- high-speed semiconductor transistor device

Potential Commercial Applications

- PC's
- Gaming machines
- Charging stations
- Displays
- Lighting

Background/Context for This Invention

There have been growing markets for high-frequency applications such as mm-wave radars; multi-Gb/s WLANs; 100 Gb/s Ethernet; and THz-imaging systems. The operation frequency of these applications ranges from 10 GHz to 1 THz, and high-speed bipolar transistors (such as InP DHBTs), especially using low-cost silicon-based IC platforms such as SiGe HBTs, are essential in realizing these applications. There exists, however, a fundamental tradeoff between the device cutoff frequency and breakdown voltage. Current approaches to address these issues have undesirable consequences such as compromising both the RF output power and the signal-to-noise ratio of such systems.

Dr. John D. Cressler

Schlumberger Chair Professor in Electronics, Ken Byers Teaching Fellow in Science and Religion - Georgia Tech School of Electrical and Computer Engineering

Jiahui Yuan

Graduate Research Assistant - Georgia Tech School of Electrical and Computer Engineering

More Information

U.S. Patent Issued - [8,546,850](#)

Publications

For more information about this technology, please visit:

<https://licensing.research.gatech.edu/technology/superjunction-collector-bipolar-transistors>

Images:

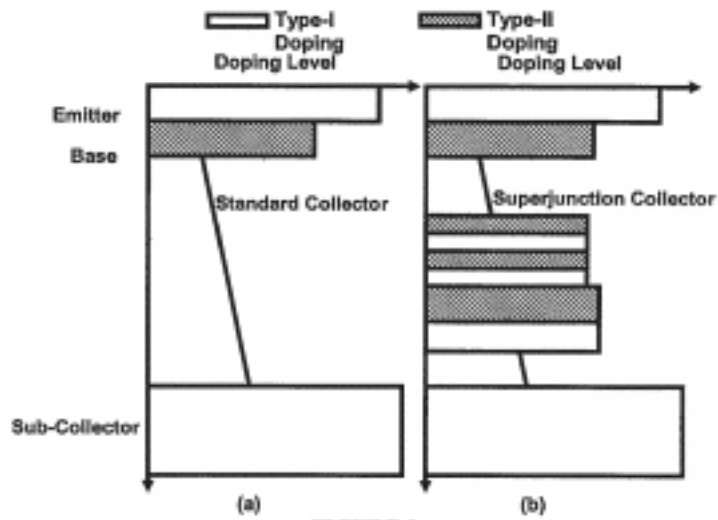


FIGURE 3

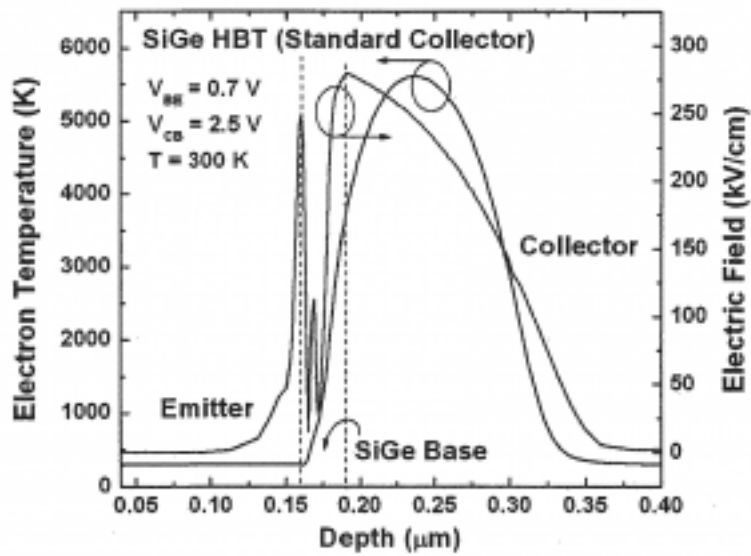


FIGURE 4