

InSb Heterostructure Bipolar Transistor Operating at Room Temperature

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We have previously demonstrated room temperature operation of InSb FETs using the technique of carrier exclusion/extraction [1]. In this paper we show that ambient temperature operation of bipolar devices can also be achieved. The resulting device shows the same low voltage characteristic as the FET, with a knee voltage of 0.2 V. Modelling shows that addition of an excluding base contact [2] results in a factor of eight reduction in leakage current. AC measurements on these 6 μm emitter devices show an f_T of over 25 GHz in a device not optimised for high speed performance, with over 600 GHz predicted for scaled devices with 1 μm emitters.

Carrier exclusion/extraction can be used to achieve ambient operation of InSb-based bipolar transistors. Demonstration devices show low voltage characteristics, and a large reduction in leakage current. The 6 μm emitter devices show an f_T of over 25 GHz, with over 600 GHz predicted for devices with 1 μm emitters.

[1] T. Ashley, A. B. Dean, C.T. Elliott, R. Jefferies, F. Khaleque and T. J. Phillips, 'High-Speed, Low-Power InSb Transistors', *IEDM Technical Digest*, Dec 1997, 751.

[2] T. J. Phillips, 2000, 'Narrow Bandgap Bipolar Transistors', *UK Patent Application No. 0012925.4*.