Highly reliable submicron InP/InGaAs HBT technology

Motivation

InP/InGaAs heterojunction bipolar transistor (HBT) technologies have made a steady progress toward over-100-Gbit/s IC applications. However, at such a high speed operation, the current gain of the HBT rapidly degrades over stress time.

Originality

The epitaxial layers of the HBT were thinned and the emitter width was scaled down to 0.5 μm. In addition to that, we used passivation ledge and refractory emitter metal. The fabricated HBT shows a current-gain cutoff frequency, f_t, of 321 GHz. It also exhibits excellent reliability at a collector current density, J_c, of 5 mA/μm^2.

Impact

This HBT technology is promising for making highly reliable submicron InP/InGaAs HBTs. Now, we are planning to fabricate over-100-Gbit/s ICs with high reliability.

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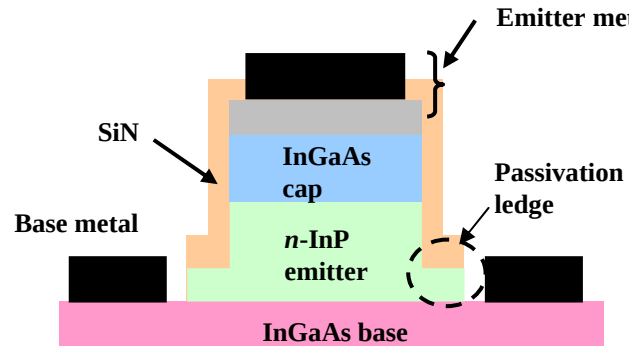

Fig. 1. Cross-sectional view of InP/InGaAs HBTs.

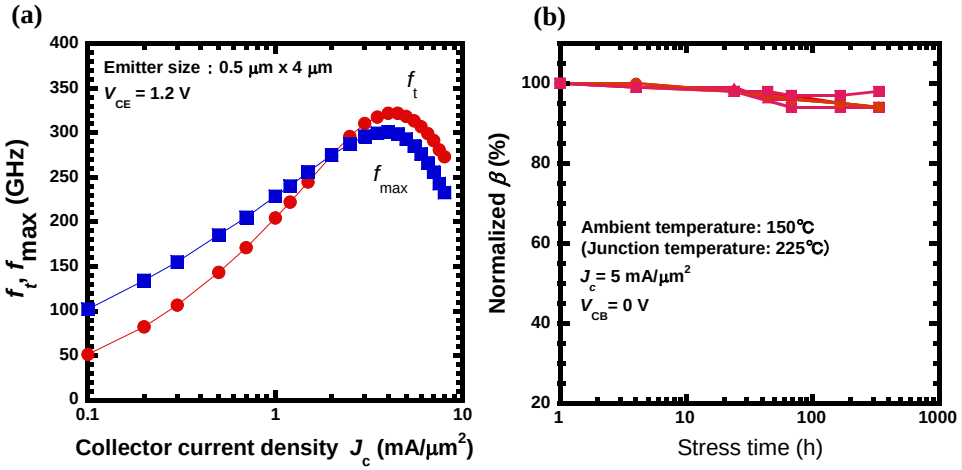

Fig. 2. (a) Current-gain cutoff frequency, f_t and maximum oscillation frequency, f_{max} as a function of J_c and (b) change in the normalized β over stress time.