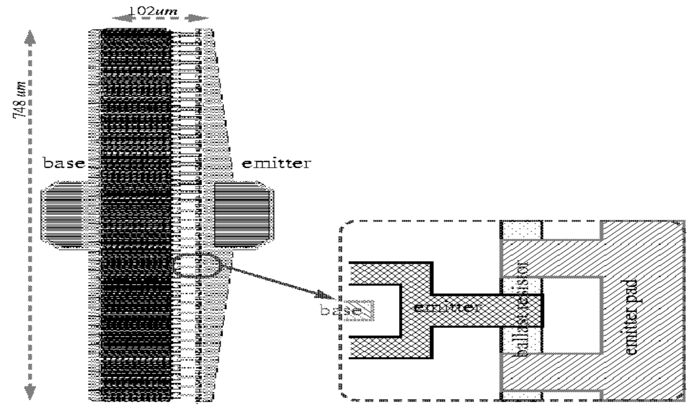

Fig 1. Modeled RF BJT layout. It consists of 80 base fingers and 81 emitter fingers. Enlarged part (a emitter finger, a base finger, and the ballast) is simulated.

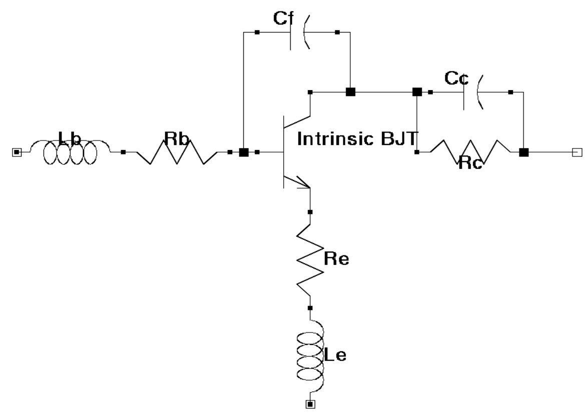

Fig 2. Modeled T-network for RF BJT. Modeling RF BJT using T-network is widely accepted.

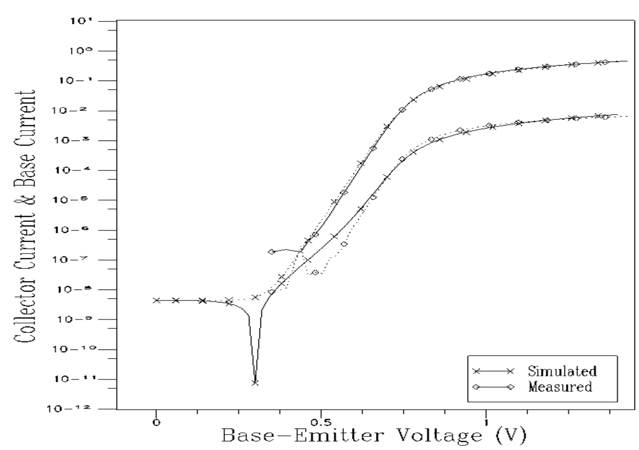

Fig 3. Fitted Gummel plots using mixed-mode device simulation. Mobility and lifetime are calibrated.

C_f	C_C	L_b	L_e	R_b	R_e	R_c
2.3 pF	60 pF	0.7 nH	0.3 nH	0.44Ω	1.20Ω	0.08Ω

Table 1. Extracted parasitic values for T-network using mixed- mode simulation.

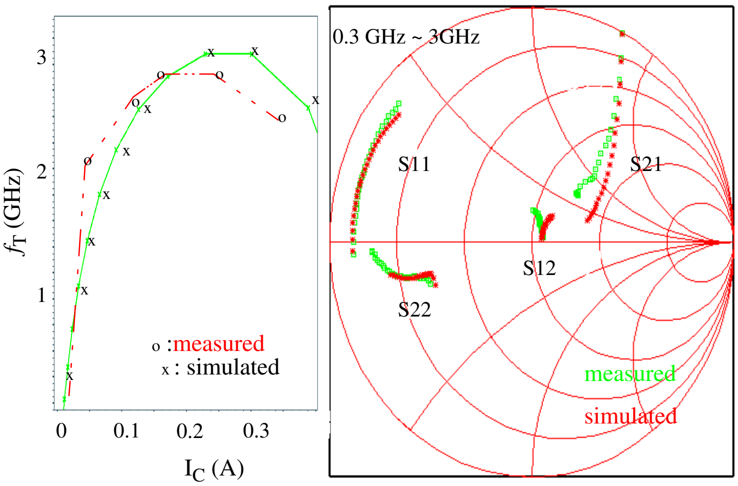

Figure 4. Comparison between measurement and simulation for I_C vs. f_T and S-parameters.

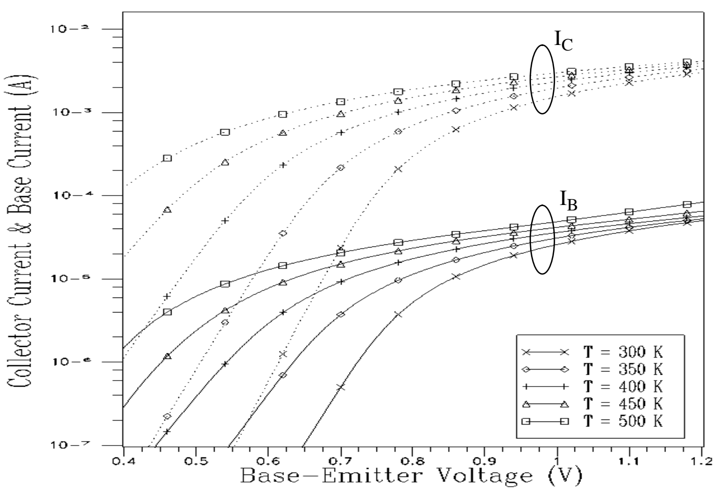

Figure 5. Gummel plots of a unit cell (a base finger and a emitter finger) with various temperature. I_B and I_C increase as T_L increases.

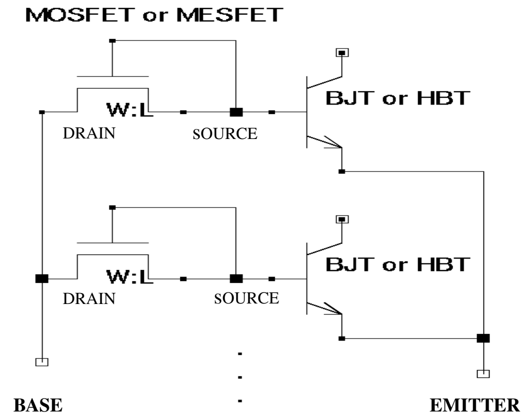

Fig 6. Circuit diagram for depletion-mode FET. Each base finger is connected to a FET.

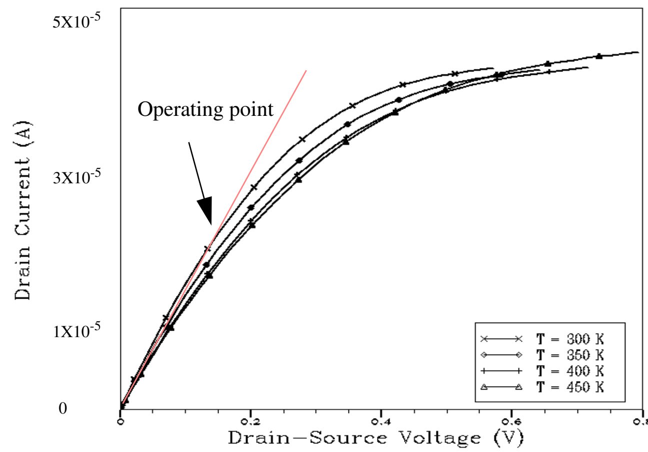

Fig 7. I_D & V_{DS} characteristics at various temperature. The operating point should be chosen close to (maximum protection) or below (maximum linearity) the onset of saturating region.

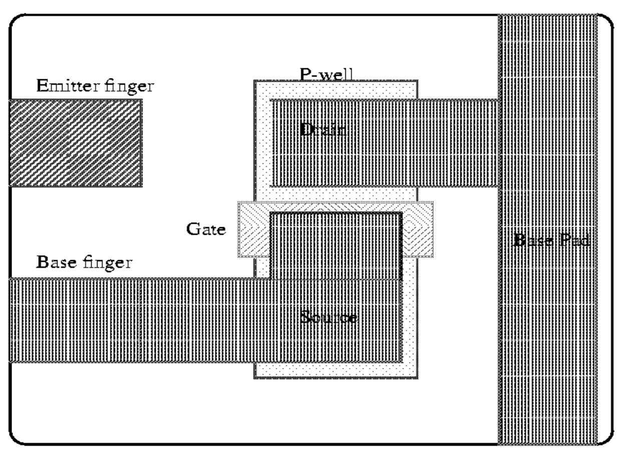

Fig 8. Proposed mask layout for new bollasting scheme.

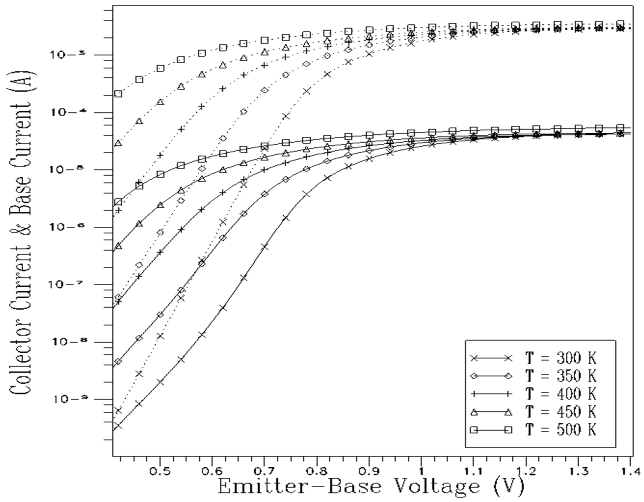

Fig 9. Gummel plot for BJT with depletion mode MOSFET. I_B and I_C are effectively limited by MOSFET at high current level.

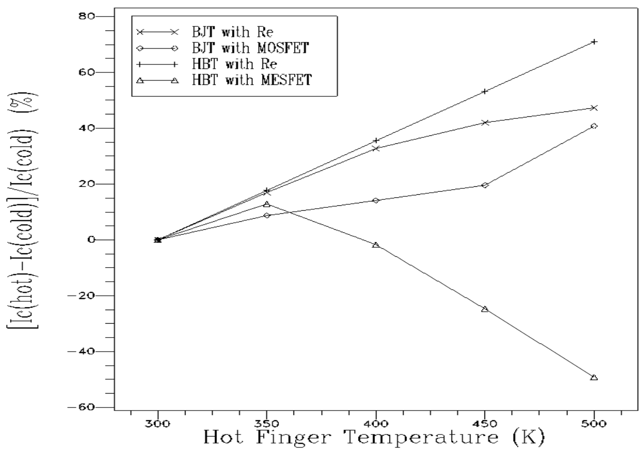

Fig 10. Percentage difference in I_C (hot finger) compared with I_C (cold finger @ T = 300 K).

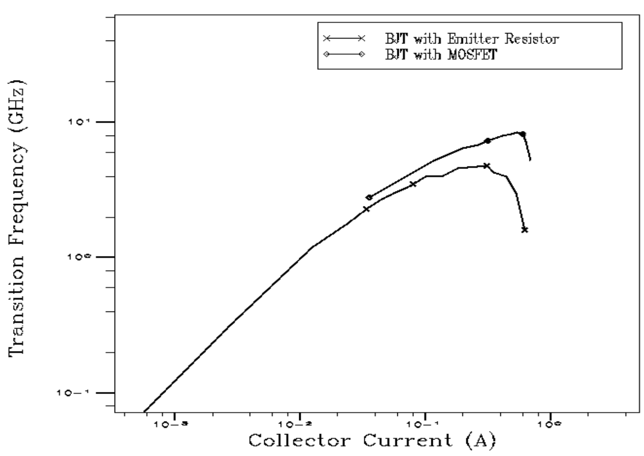

Fig 11. Transition frequency (f_T) vs. total I_C. BJT with depletion-mode MOSFET has higer f_T (@ V_{CE} = 5 V, and T = 307 K).

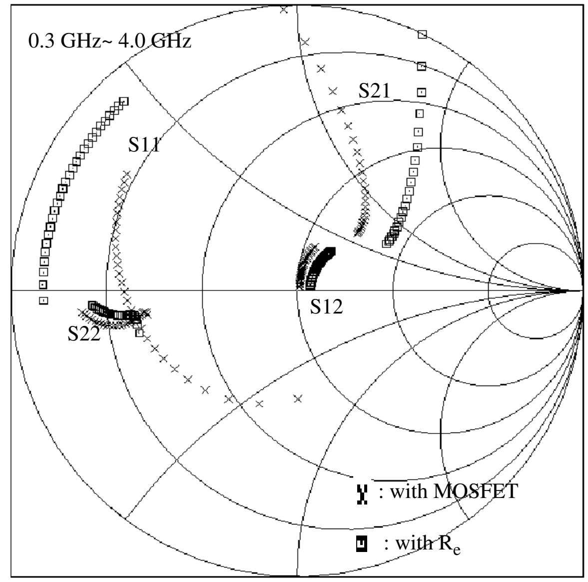

Fig 12. S-parameter comparison between BJT with depletion-mode ballasting and BJT with emitter ballasting.

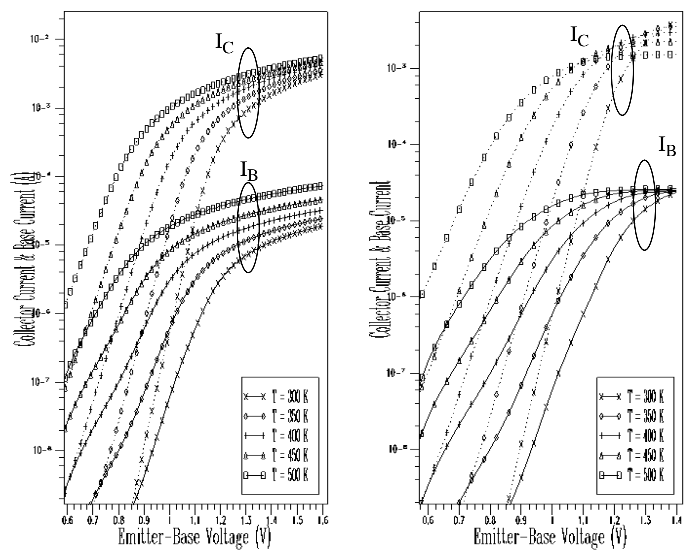

Fig 13. Gummel plot for HBT with emitter resistor (left) and HBT with depletion-mode base ballasting (right) at various temperature.