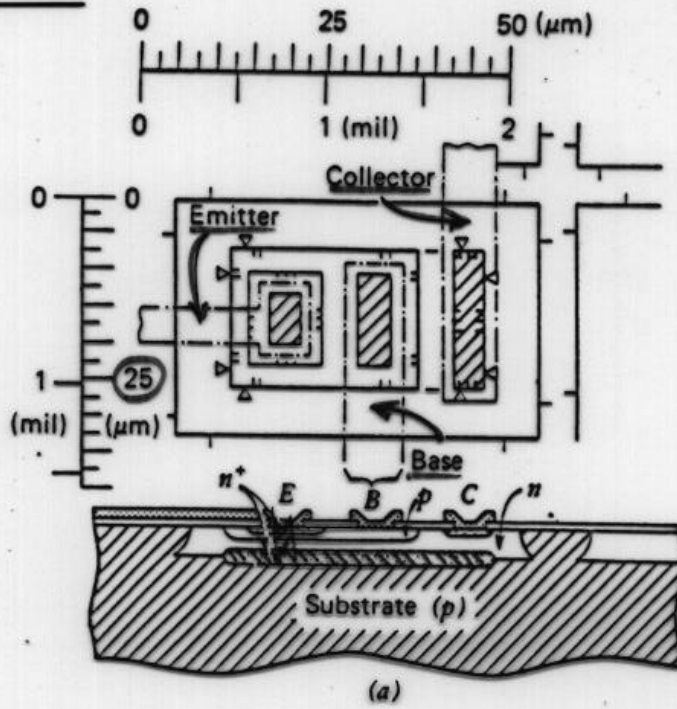
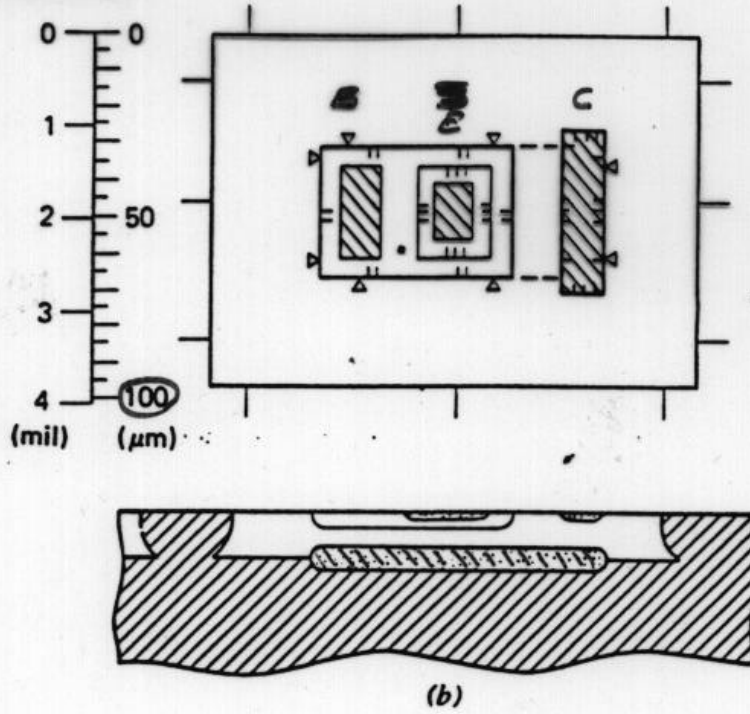


SWITCHING



AMPLIFYING



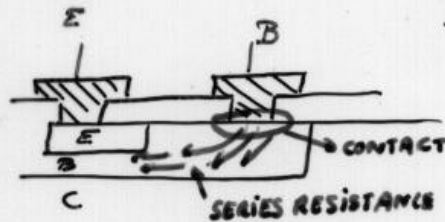
ENGINEERING ISSUES

- TRANSISTOR BASE :

DOPING : LOW BECAUSE MAXIMIZES $\gamma = \frac{\tau_{ME}}{\tau_{ME} + \tau_{PB}}$

BUT NOT TOO LOW : METAL-SEMICONDUCTOR CONTACT
(AVOID OHMIC LOSS AT THE BASE CONTACT)

- REDUCES SERIES RESISTANCE IN THE BASE



WIDTH : ~~REDUCED~~ SHORT TO INCREASE $\alpha_T = 1 - \frac{x_{B2}^2}{2L_n^2}$
⇒ INCREASE β

BUT NOT TOO SHORT : AVOID PUNCH-THROUGH
OVERLAP BETWEEN COLLECTOR AND EMITTER JUNCTION SPACE CHARGE



- TRANSISTOR EMITTER :

DOPING : VERY HIGH ($10^{20} / \text{cm}^3$) TO INCREASE γ

BUT NOT EXCESSIVELY HIGH : $-\tau_p \downarrow \rightarrow \tau_{sp} \uparrow$ } $\gamma \downarrow$

- BAND GAP NARROWING