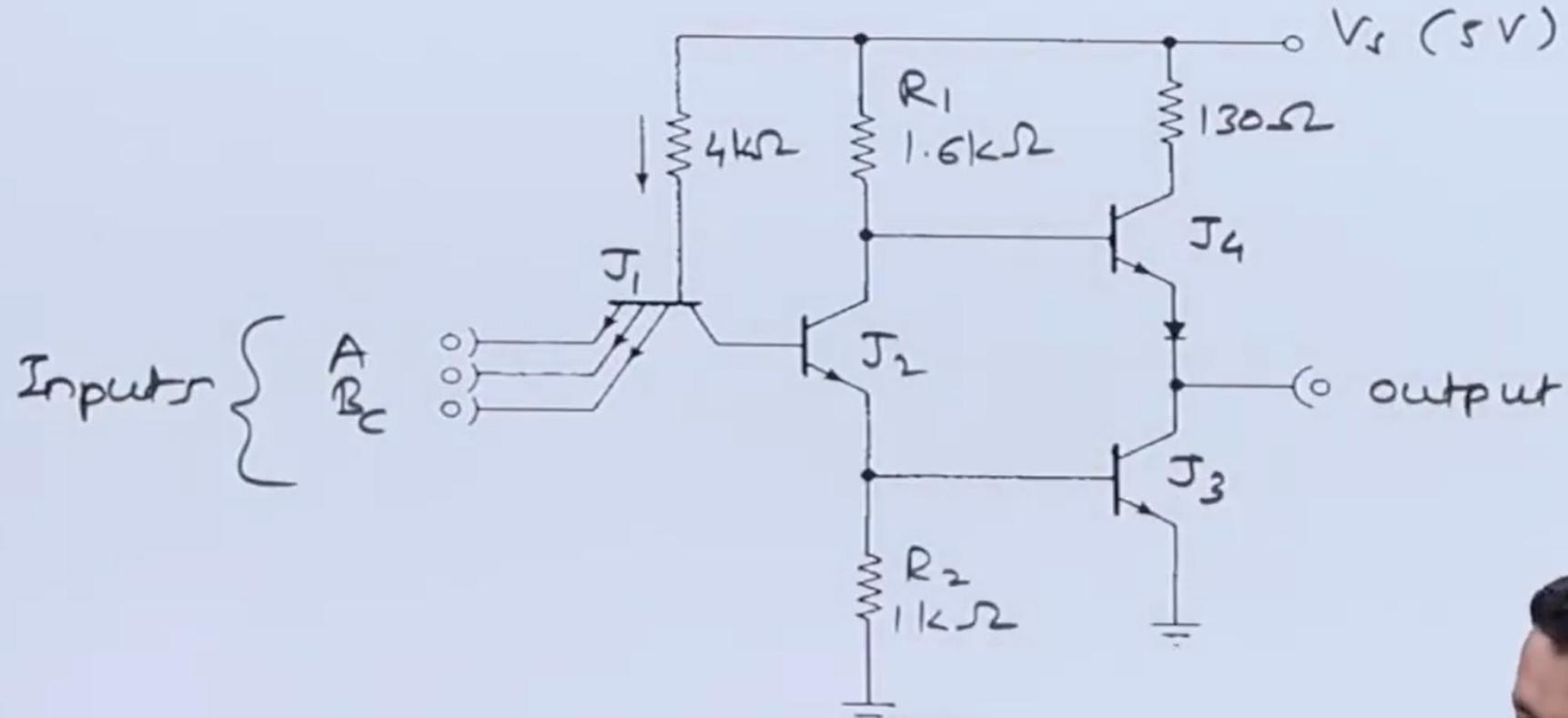
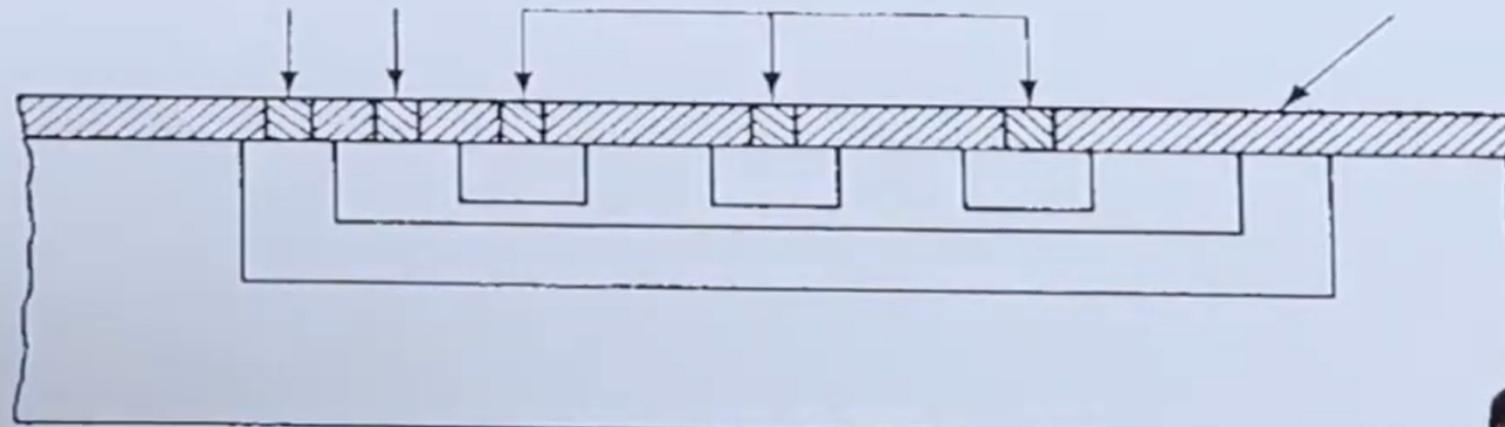


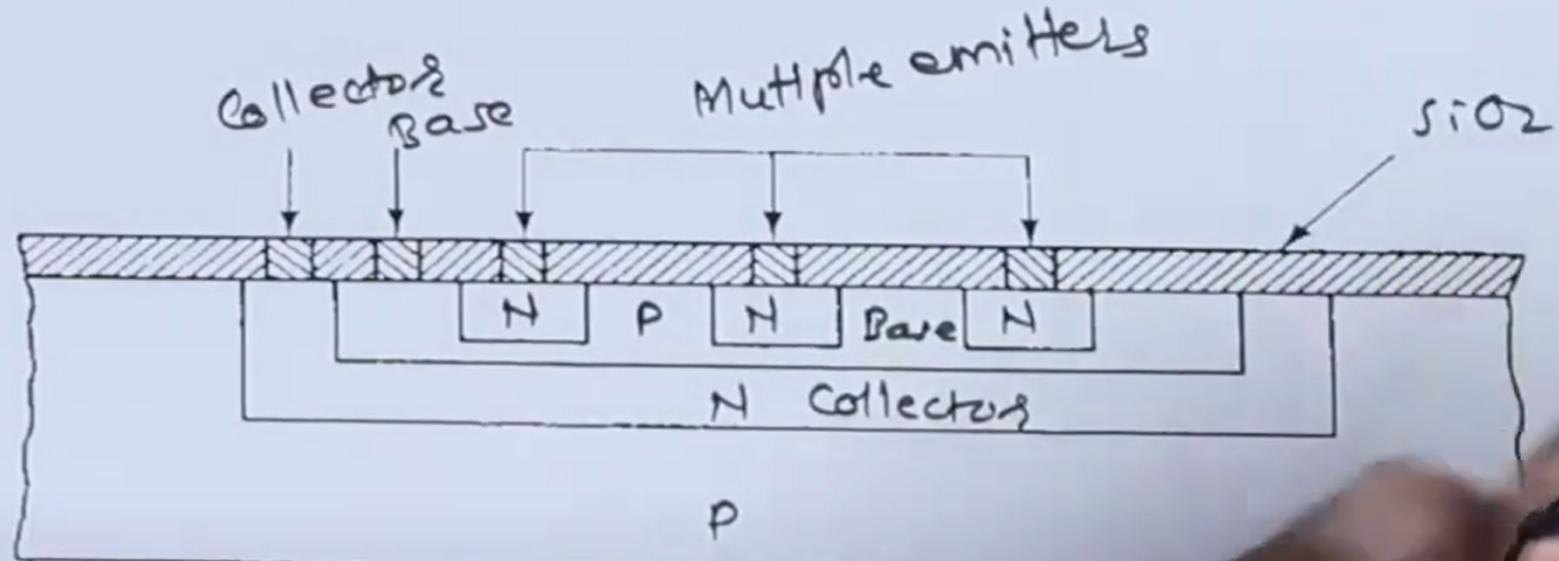
IC

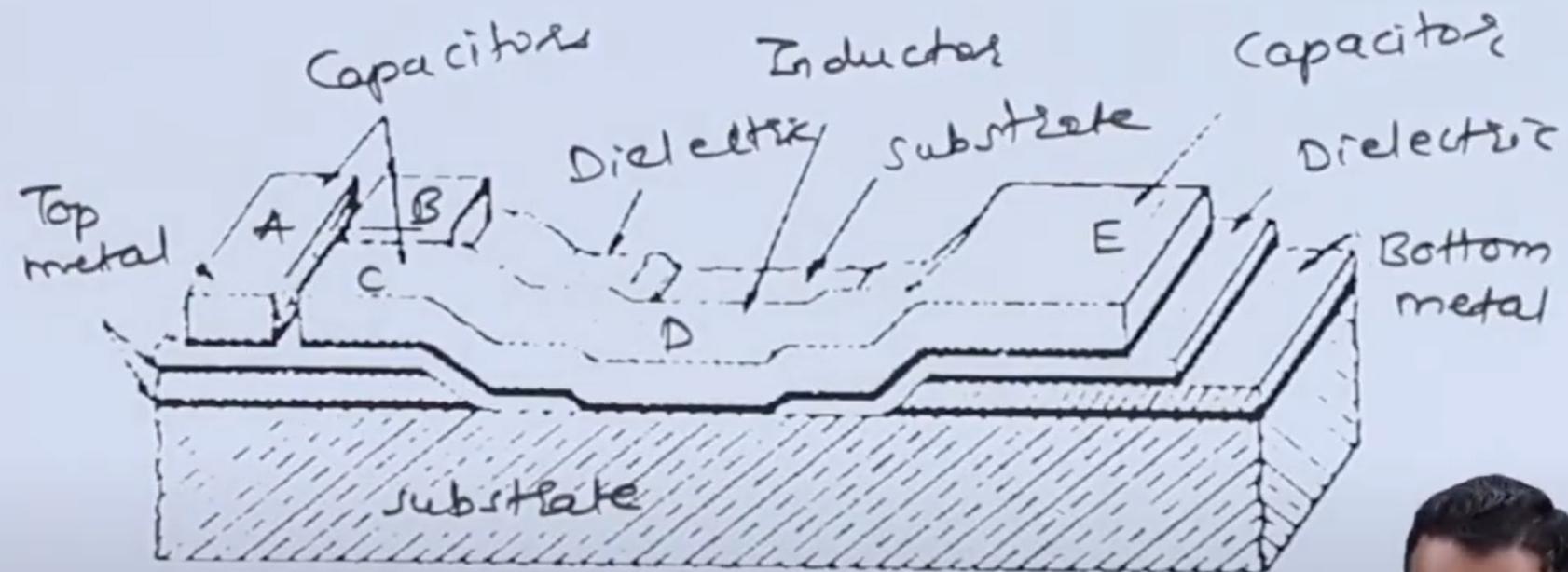
active ✓
passive ✓

① Discrete circuit :











- ① Low cost
- ② small size
- ③ Light weight
- ④ High reliability
- ⑤ Reproducibility improved
- ⑥ Improved performance

space and military applications

Materials of Monolithic Microwave Integrated Circuits

- ① substrate materials : alumina, beryllia, ferrite / garnet, GaAs, glass, rutile, sapphire
- ② Conductor materials : Al, Cu, gold, silver
- ③ Dielectric films : Al_2O_3 , SiO , SiO_2 , Si_3N_4 , Ta_2O_5
- ④ Resistive films : Cr, Cr-SiO, NiCr, Ta, Ti

* Characteristics of substrate materials

- $\epsilon_s \uparrow$
- $\tan \delta \downarrow$
- ϵ_r f
- high purity
- $R \uparrow$ β
- High thermal conductivity

Conductor materials:

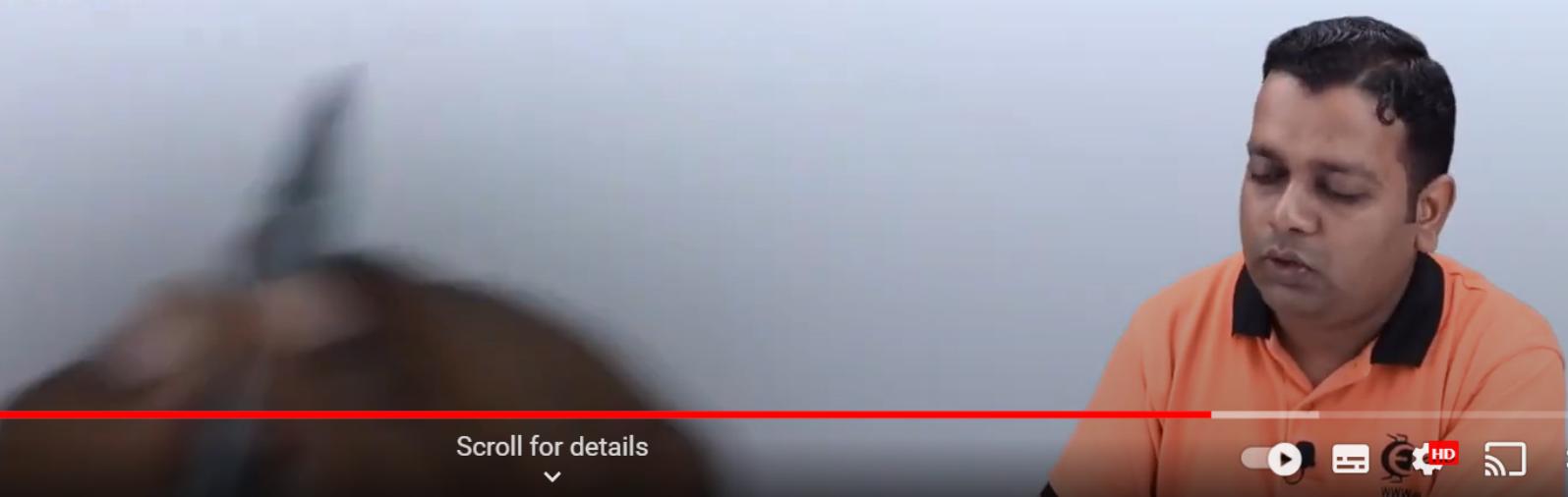
- $\sigma \uparrow$
- Temp. \downarrow
coeff.
- Good adhesion to substrate
- etchability
- easy deposit

Dielectric material

Reproducibility

high voltages

RF dielectric loss ↓



Resistive materials

- Good stability
- TCR ↓
- dissipation capacity
- ρ_r 10 to 1000 Ω per sq.

