YANG-LONG METHOD FOR EXTRACTION OF SOURCE/DRAIN RESISTANCE IN GaAs MESFETS

[EDL, 7, No.2, Feb 1986]

METHOD

1) Select a $V_{DS} = 0.25V$, it should be $V_{DS} - I_D R_S > 7nV_t$, where n is gate diode ideality parameter. ($n = 1 - 1.5$)
2) Select I_{DS1} such that the corresponding V_{GS} is 0.3 - 0.5V
3) Select I_{DS2} such that $I_{DS2} / I_{DS1} = 1.1$
4) Sweep I_G from about 50 μA to 500 μA in 10 steps
5) Measure V_{GS} for every I_G, I_{DS1}, I_{DS2}.
6) Calculate R_S with:

$$R_S = \frac{\left[(V_{G2} - V_{G1}) + nV_t \ln(F2/F1)\right]}{I_{D2} - I_{DS1}}$$

→ V_{G2} is the measured V_{GS} for a given I_g when I_{DS2}
→ V_{G1} is the measured V_{GS} for a given I_G when $I_D = I_{DS1}$
→ n is the gate non ideality factor extracted already
→ $V_t = 26mV = KT/q$
→ when $I_2/I_1 = 1.1$, $F_2/F_1 \sim 0.9$

7) After R_S extraction, ensure/verify that $V_{DS} - I_D R_S$ is still $> 7nV_t$, to confirm validity of extraction.

COMMENTS

- To understand what I_D values are required in the measurement, the I_D-V_D measurement should be made first.
- It is convinient to use $I_{D2}/I_{D1} = 1.1$ so that $F_2/F_1 \to 0.9$ and resulting calculation of R_S can be done.
- Resulting R_S extracted should be independant of V_{GS}