

Ka-Band Phased array Beamforming Using Dual mode Common-Leg T/RX Channel

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Introduction

- Compact T/RX channel for phased array beamforming system
- Handle wider range of signal levels
- 28-nm CMOS LPP

Main Subject

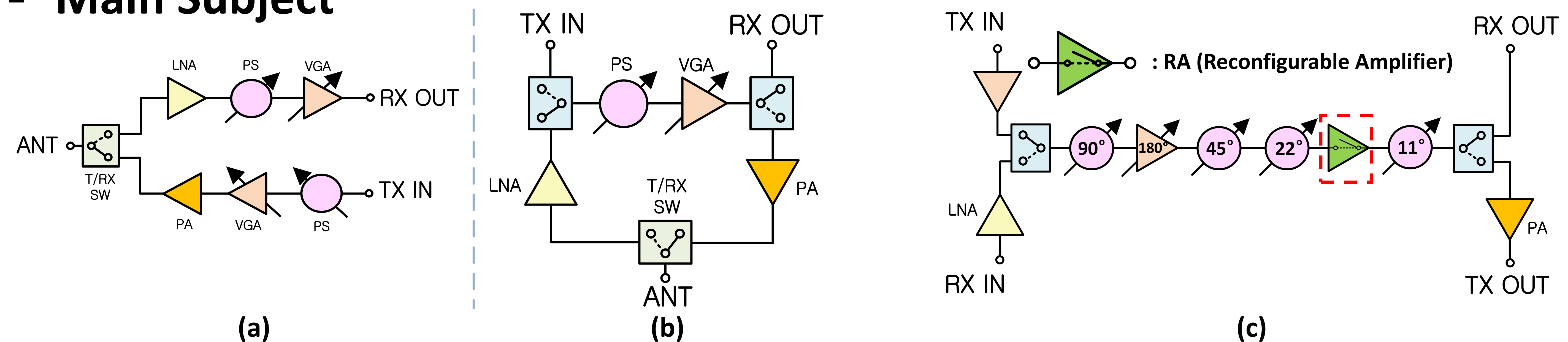


Fig 1. (a) Conventional T/RX Architecture (b) Common-Leg Architecture (c) Dual Mode Common-Leg using Reconfigurable Amplifier

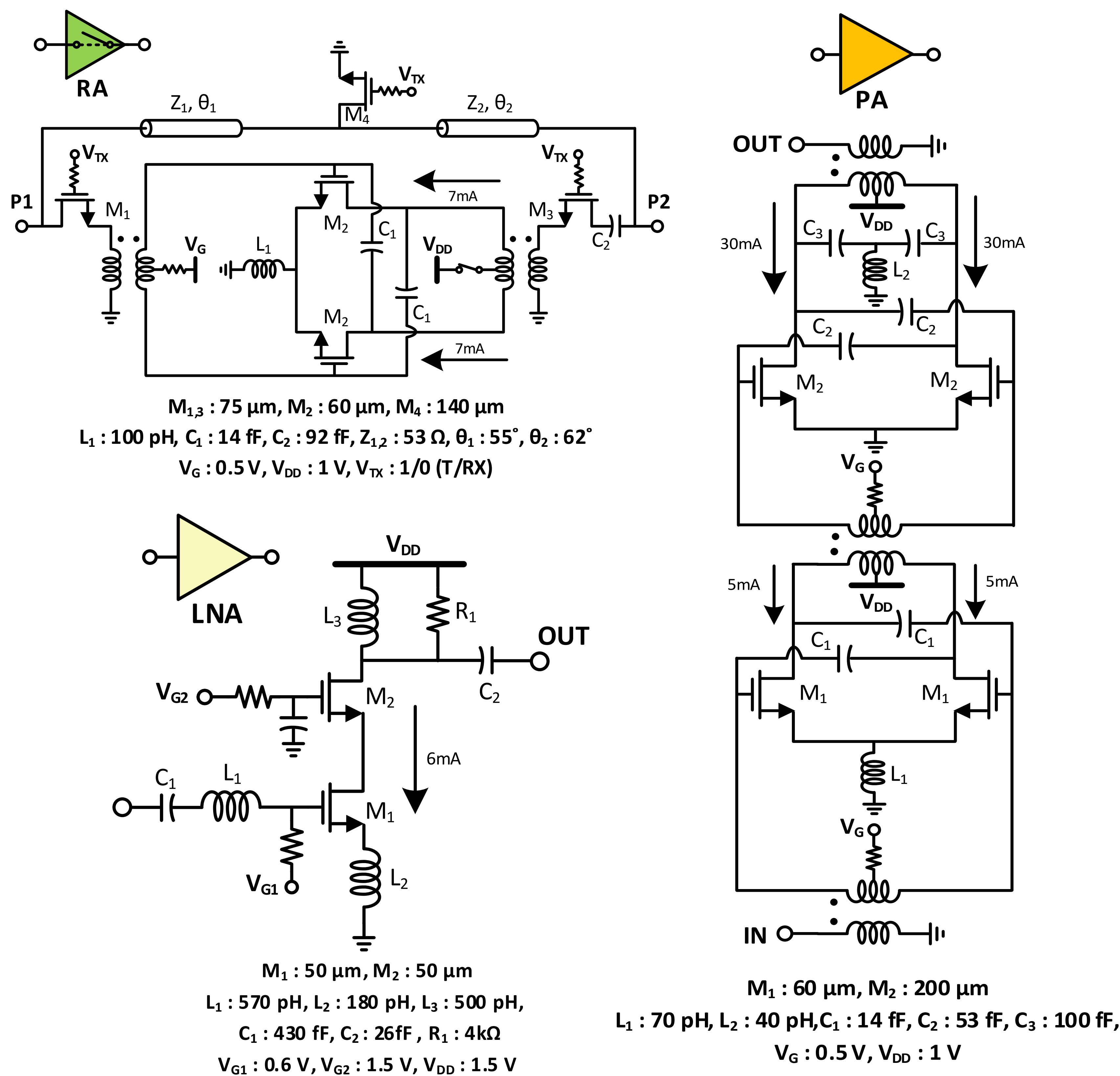


Fig 2. Reconfigurable Amplifier, Power Amplifier, Low noise Amplifier schematic

Conclusion

- Compact and low calibration cost using common(shared) T/RX Path
- Low Gain mode w/o NF degradation
- External front-end module usable

Reference

[1] Umut Kodak et al., "A 5G 28-GHz Common-Leg T/R Frond-End in 45-nm CMOS SOI With 3.7-dB NF and -30-dBc EVM With 64-QAM/500-Mbaud Modulation," *IEEE Transactions on Microwave Theory and Techniques*, Vol. 67, no. 1, pp. 318-331, Jan. 2019.

- RA (Reconfigurable Amplifier)를 활용하여 High gain mode와 Low Gain mode 로 동작 시킴
- RX path에서 각 block의 위치를 적절하게 배치하여 Low gain mode에서의 Noise Figure degradation을 최소화 함
- External PA, LNA와 연결하여 사용할 수 있어, low cost high performance가 가능함

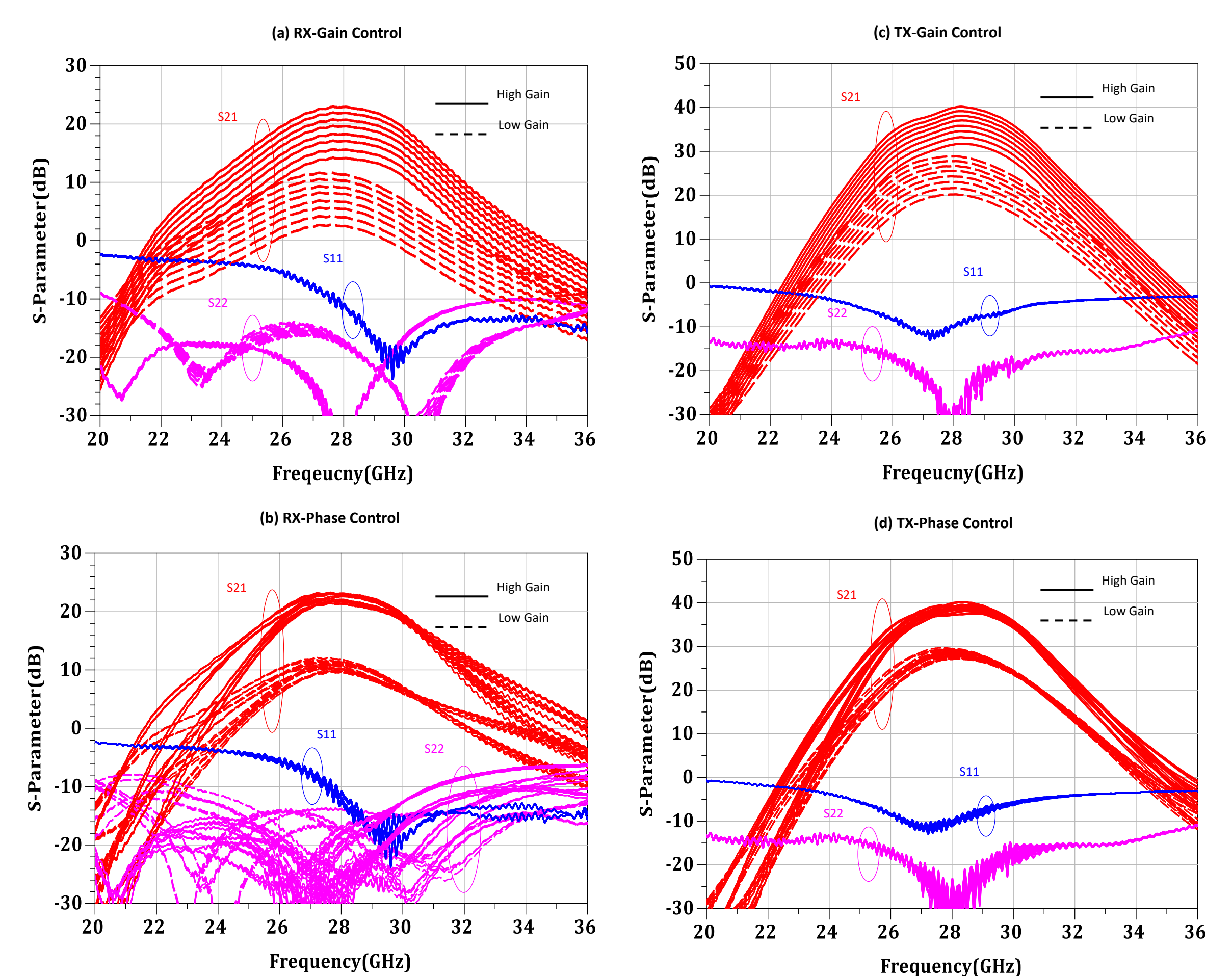


Fig 3. Measured S-parameters in dual TRX modes

- TX mode High/Low Gain mode gain and OP1dB 39dB/27dB and 10dBm @ 28.5GHz
- RX mode High/Low Gain mode gain and IP1dB 22dB/10dB and -21dBm/-15dBm @ 28.5GHz

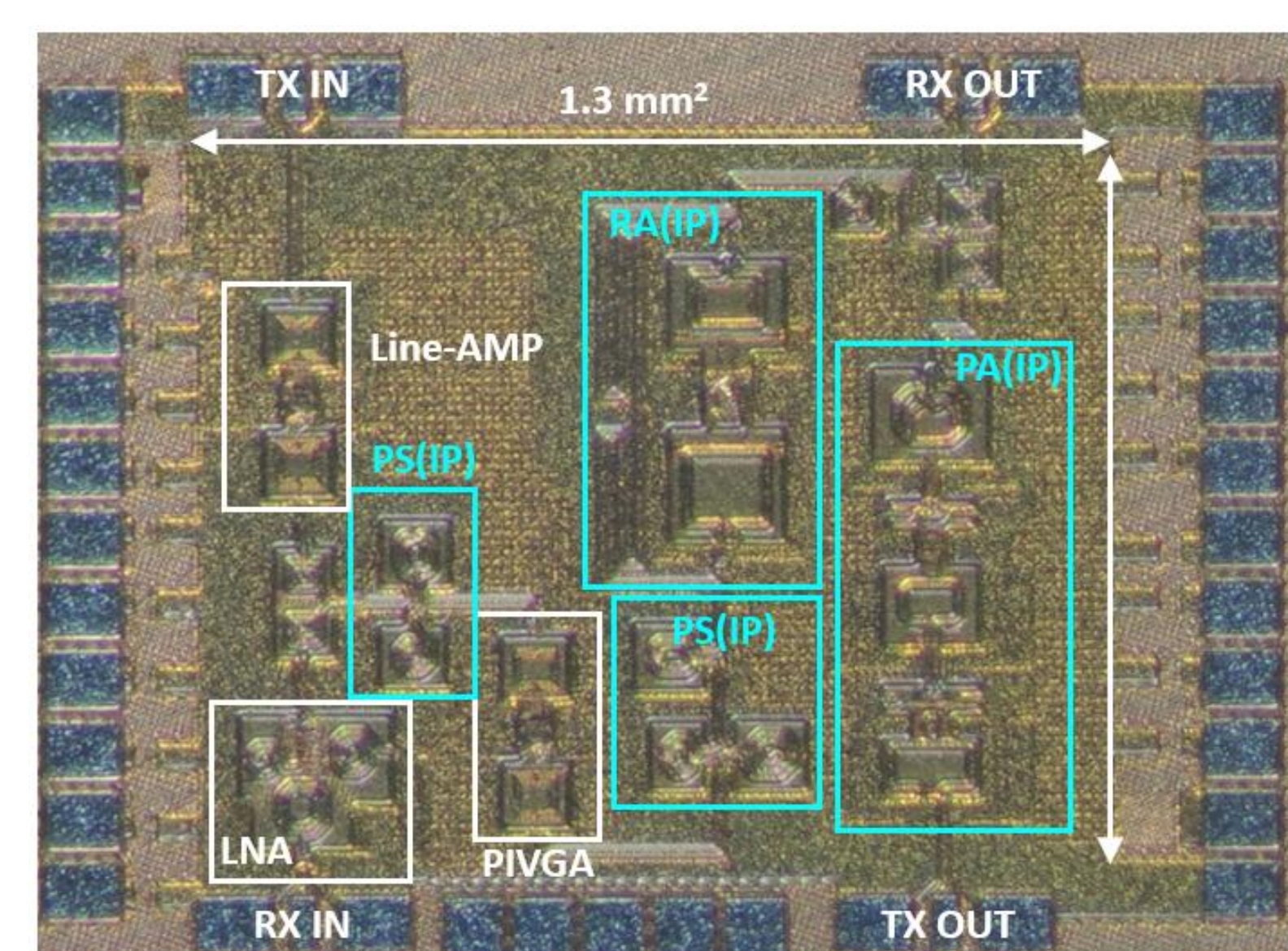


Fig 4. Chip photograph of Common-leg T/RX Channel