

A Single Pole Double Throw CMOS Switch with 27 GHz Bandwidth and -20 dB Isolation

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1. Introduction

A 0.1-27 GHz Tx/Rx single pole double throw (SPDT) switch was developed on 65 nm technology for 27 GHz bandwidth radar based impulse radio communication. The schematic and die photograph of the switch have been shown in Fig.1 and Fig.2, respectively. The switch connects Tx port (transmitter) to Ant port (Antenna) at control signals CT1=1, CR1=0 and Ant port to Rx port (receiver) at CT1=0, CR1=1. To attain wide band matching, inductor was used in each port. Triple well process with body floating MOS transistors were used to reduce substrate leakage current and improve insertion loss.

2. Result and Discussion

The measured insertion loss is 1.7 to 6.5 dB in Tx mode and 3.3 dB to 8.3 dB at Rx mode from 0.1 to 27 GHz (Fig 3). Fig. 4 shows the measured input return loss, which is less than -10 dB from 0.1 to 27 GHz at Tx mode and 0.1 to 30 GHz at Rx Mode. Measured values of isolations from Tx port to Rx port are shown in Fig. 5, which are -60 dB to -30 dB at Tx mode and -50 to -20 dB at Rx mode from 0.1 to 30 GHz.

3. Conclusion:

A 65 nm CMOS 1.7 to 6.5 dB insertion loss, -60 dB to -30 dB isolation, Tx/Rx SPDT switch has been developed, from 0.1 to 27 GHz, at Tx mode, for short range radar based transceivers. The switch consumes almost zero power from 1.2 V power supply, with a die area of 0.8 mm² including ESD pad.

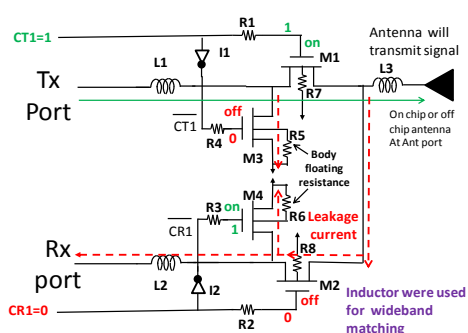


Fig. 1. Schematic diagram of the SPDT switch.

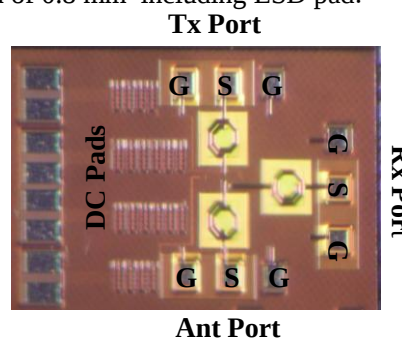


Fig. 2. Chip die photograph of SPDT on 65 nm CMOS Technology.

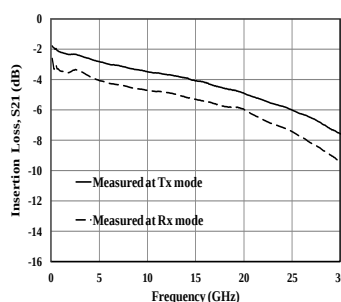


Fig. 3. Measured values of insertion loss in Tx and Rx mode.

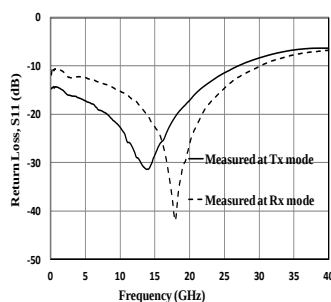


Fig. 4. Measured values of input return loss in Tx and Rx mode.

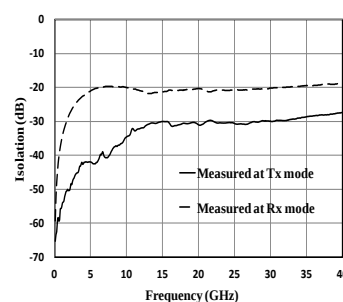


Fig. 5. Measured values of isolation in Tx and Rx mode.