

DESIGN OF HIGH GAIN UWB POWER AMPLIFIER USING CURRENT-REUSE TECHNIQUE CMOS 0.13-MM TECHNOLOGY

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1. Introduction

In recent years, researches on Power Amplifier (PA) for wireless applications are getting attentive. Complementary Metal Oxide Semiconductor (CMOS) technology are more desirable especially for Ultra-Wideband (UWB) applications due to its low-cost solutions, single-chip and very low power consumption. Two UWB standards have been proposed namely Multiband Orthogonal Frequency Division Multiplexing (MB-OFDM) and Direct-Sequence Code Division Multiple Access (DS-CDMA) [1]. BPSK and Bi-Orthogonal Keying (BOK) mode is used for DS-UWB to supports the data communication [1]-[2]. Figure 3.1 shows DS-UWB signal transmission with two important bands which are low band from 3.1-4.85 GHz and high band from 6.2-9.7 GHz. The advantages of DS-UWB are such as high efficiency, longer battery life, robust and accurate spatial resolution for detecting the location. By having numerous advantages such as high data rate on very low power and short distance range technology makes UWB as a fascinating technology.

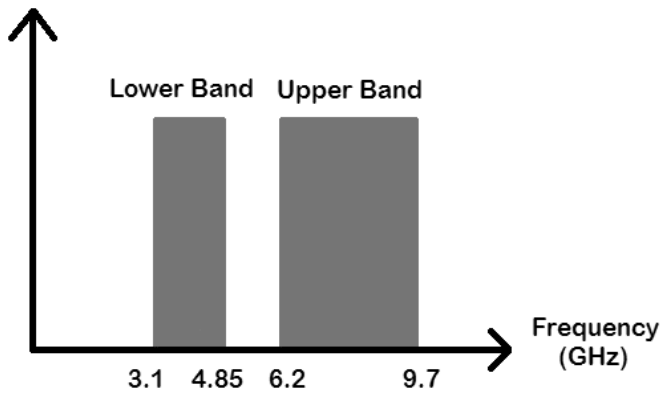


Figure 3.1. DS-UWB spectrum allocation.

Since PA is a critical component to deliver high power for UWB transmitter, the implementation of Radio Frequency (RF) is one of the challenging aspects in UWB RF systems. Crucial characteristics for a demanding PA are linearity, gain, efficiency, power consumption, stability and output power (P_{out}). Thus, a variety of CMOS PA designs for UWB applications have been proposed with distinctive design techniques such as distributed amplifier, resistive shunt feedback, RLC matching, shunt-shunt feedback, shunt peaking, inductive source degeneration, current-reused and stagger tuning to match the best outcomes as each of the technique offers different performance depending on the required specification for the PA design. Thus, a high gain UWB PA for 3.1- 5.1 GHz frequencies by adopting current-reused technique is proposed by using 0.13 μm CMOS technology.

2. PA Topology Review

There are many topologies have been implemented for wideband communication applications with CMOS technology. Ever since MB-OFDM and DS-CDMA are two main solution for UWB transceiver, various UWB PA designs for different frequency bands with numerous topologies have been presented. Each topology has its own advantages and disadvantages, leading to difference performances based on the