Low-Power Medical Implant Communications Service (MICS) Transceiver

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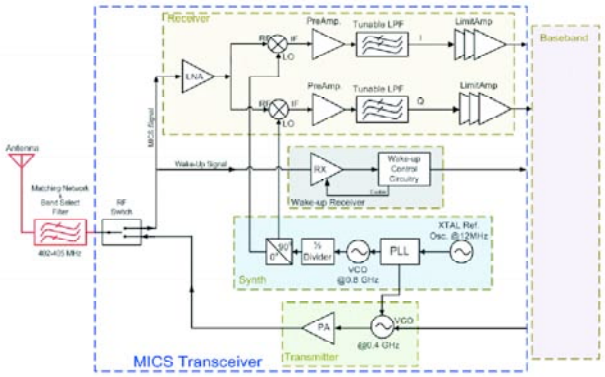
The medical implant communications service (MICS) is an unlicensed, mobile radio system for transmitting data between an outside control unit and implanted medical devices. The MICS transceiver will enable important new applications such as auditory and visual prosthetics and bio-signal recording. In 1999, the FCC allocated the frequency band of 402–405MHz on a shared secondary use basis for medical implant communication services. Biocompatibility, ultra-low-power consumption, and extremely small size are some of the challenges in developing an implant device.



The top figure shows the block diagram of the MICS transceiver. All circuit building blocks with the exception of the RF switch and wake-up receiver have been implemented with a 0.18μm IBM RF CMOS process. The bottom figure shows the micro-photograph of the MICS transceiver, which measures 3mm x 3mm. Reduced supply voltage (1V) has been used for all the circuit blocks for low-power consumption. After careful design of each block, such as LNA, Mixer, PA, and VCO, corners analyses and post-layout simulations are used to ensure first-pass success. Use of reduced supply voltage (1V) and low-power operation presents many challenges for RF and analog circuits. Reduced overdrive voltage and low-current biasing results in increased sensitivity to process and supply variations. In response, dynamic body biasing has been employed to improve the circuit performance for process and supply variations. In TX and RX modes, the MICS transceiver consumes 5mA and 4mA, respectively. Overall, NF of the receiver is 8dB. An 80-pin TQFP is used for testing and characterization of the transceiver building blocks. Lastly, surface-mount PCB is used for test and characterization. ■