|  |
| --- |
| **基于XC7Z100+ADRV9009的双收双发无线电射频板卡** |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 一、板卡概述     基于XC7Z100+ADRV9009的双收双发无线电射频板卡是基于Xilinx ZYNQ FPGA和ADI的无线收发芯片ADRV9009开发的专用功能板卡，用于5G小基站，无线图传，数据收发等领域。       二、板卡原理及功能     板卡使用XC7Z100 作为主处理器，包含Dual ARM Cortex-A9核处理器的嵌入式处理。PS端32bit 1GB容量DDR3存储、1路RS232接口、1路USB接口、1路10-100-1000网络接口，PS端32M QSPI flash存储、SD卡接口、8G eMMC存储；PL端64bit 2GB容量DDR3存储，PL端扩展HDMI 输出实现视频显示应用，PL端扩展9路I/O，2路SPI\_LVDS接口、2路RS232接口、4个LED指示灯。      PL端外扩ADRV9009芯片，ADRV9009是一款高集成度射频(RF)、捷变收发器，提供双通道发射器和接收器、集成式频率合成器以及数字信号处理功能。这款IC具备多样化的高性能和低功耗组合，具有2路输入，2路输出，两路观测输入配合FPGA工作满足3G、4G和5G宏蜂窝时分双工(TDD)基站应用要求。    板卡数字接口：   * PS 端32bit 1GB 容量 DDR3 存储 * PS端RS232接口 * PS端USB接口 * PS端1路 10-100-1000 Mbps Ethernet (RGMII​) 网络接口 * PS端QSPI flash 存储 * PS端 SD卡，Emmc存储 * PL端64bit 2GB 容量DDR3 存储 * PL端扩展HDMI 输出实现视频显示应用 * PL端扩展9路 I/O、2路SPI\_LVDS、2路RS232、4路LED指示灯 * PL端扩展1路10G SFP+光纤接口     板卡模拟接口：   * 双接收：RX1、RX2 * 双发送：TX1、TX2 * 双观测接收：ORX1、ORX2 * 外部本振接口：EXT\_LO * 外部时钟参考：REF\_CLK\_IN     板卡性能指标：   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | No | Items | Specifications | | Remark | | Tx | 1 | Frequency | 75~6000 MHz | | Frequency > Bandwidth/2 | | 2 | Bandwidth | Large Signal Bandwidth:5~100MHz  Synthesis Bandwidth: 10~200MHz | | Software Support Range | | 3 | Transmission Power | 7dBm | | 100~6000MHz, CW  0 dB TX attenuation | | 4 | EVM |  | |  | | 5 | Attenuation Control Range | 32dB | |  | | 6 | Attenuation Step | 0.05 dB | |  | | 7 | ACLR |  | |  | | 8 | Spurious |  | |  | | 9 | SSB Suppression |  | |  | | 10 | LO Suppression |  | |  | | 11 | DAC Sample Rate (max) | 61.44MHz/122.88MHz/245.76MHz | | Default VCXO Support | |  | | | | | | | Rx | 1 | Frequency | 75~6000 MHz | | Frequency > Bandwidth/2 | | 2 | Bandwidth | 16 to 100 MHz | | Software Support Range | | 3 | Sensitivity | -93dBm@20MHz | | Noise Figure <3dB | | 4 | EVM | <1.5% | | @ -30dBm input | | 5 | Gain Control | AGC | |  | | MGC: | Range: 0~30dB |  | | Step:  0.5dB |  | | 6 | Gain Step | 0.5dB | |  | | 7 | Rx Alias Band Rejection | 80dB | | Due to digital filters | | 8 | Noise Figure | <3dB | | Maximum RX gain | | 9 | IIP3 (@ typ NF) | -25dBm | |  | | 10 | ADC Sample Rate (max) | 61.44MHz/122.88MHz | | Default VCXO Support | | 11 | ADC Wideband SFDR | 78dBc | |  | |  | | | | | | |  | 1 | Voltage | 3.3V& 12V | |  | | 2 | ON/OFF TIME | <6us | | TDD model | | other | 3 | Duplexing Model | TDD | |  | |  | 4 | Power Consumptions | <10W | |  |       物理特性   * 尺寸：100x162.4mm； * 工作温度：工业级 -40℃～ +85℃。 * 工作电压+12V  ±1V；整板功耗20W。   **三、软件系统**  参考ADI的整体软件架构：      AD9009设备树及驱动 SPI访问，AD，DA访问  驱动文件<https://wiki.analog.com/resources/tools-software/linux-drivers/iio-transceiver/adrv9009>              AD采集1.2G波形：      DA  输出设置1.2G及波形： | |