Hittite Microwave Corporation
HMCAD1511
2 GSPS Oscilloscope solution

Hittite MICROWAVE CORPORATION

Part Number	Function / Mode	Resolution (bits)	Sample Rate (MSPS)	Power Dissipation[2][3]	SNR (dBFS)	SFDR (dBc)	Package
HMCAD1511	Single Channel	8	1000	710 mW	49.8	49 / 64 [1]	LP7DE
	Dual Channel	8	500	710 mW	49.8	44 / 63 [1]	
	Quad Channel	8	250	710 mW	49.8	57 / 70 [1]	
HMCAD1510	Single Channel	8	500	295 mW	49.8	49 / 65 [1]	LP7DE
	Dual Channel	8	250	295 mW	49.8	59 / 69[1]	
	Quad Channel	8	125	295 mW	49.7	60 / 69 [1]	

Features

✓ *Multiple Modes*
  - ✓ *Single channel 8-bit up to 1000 / 500 MSPS*
  - ✓ *Dual channel 8-bit up to 500 / 250 MSPS*
  - ✓ *Quad channel 8-bit up to 250 / 125 MSPS*
✓ *SPI Configurable Operational Modes*
✓ *SPI Configurable Number of Channels*
✓ *1µs Switching Time Between Configurations*
✓ *Internal 1X to 8X Clock Divider*
✓ *Wide Range Digital Gain*
✓ *LVDS output*
  - ✓ *Full robustness in RSDS (Low Current) Mode*
✓ *Ultra Low Power Dissipation*
  - ✓ *Dynamic power vs. sample rate scaling*
✓ *Coarse & Fine Gain Control*
✓ *48 Pin QFN Package*
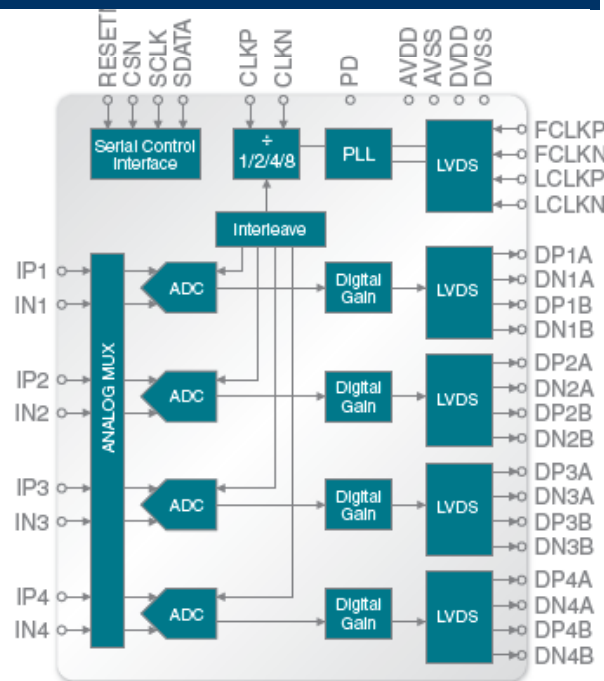
[1] Excluding Interleaving Spurs
[2] Supply Voltage (Vdd) +1.8 Vdc Analog Supply (Avdd) and +1.8Vdc Digital Supply (Dvdd)
[3] Output Supply Voltage (OVdd) +1.7 to +3.6 Vdc

2X interleaved HMCAD1511: 2 GSPS solution

- ✓ *2 GSPS clocking achieved by 180º (inverted) input clock*
    - ✓ *Differential clock: CLKP and CLKN crossed between the ADCs*
    - ✓ *Recommended Hittite clock driver: HMC830*
- ✓ *HMCAD1511 in 2GSPS setup*
    - ✓ *Wide range digital gain allows low signal swing on analog input*
    - ✓ *Compact (7*7mm) package allows short traces on PCB*
    - ✓ *SPI Interface for sync and gain skew compensation*
- ✓ *Analog input network*
    - ✓ *One ADC driver per ADC input*
    - ✓ *No External switches needed*
    - ✓ *Matched input network*
        - ✓ *Matched traces for analog input*
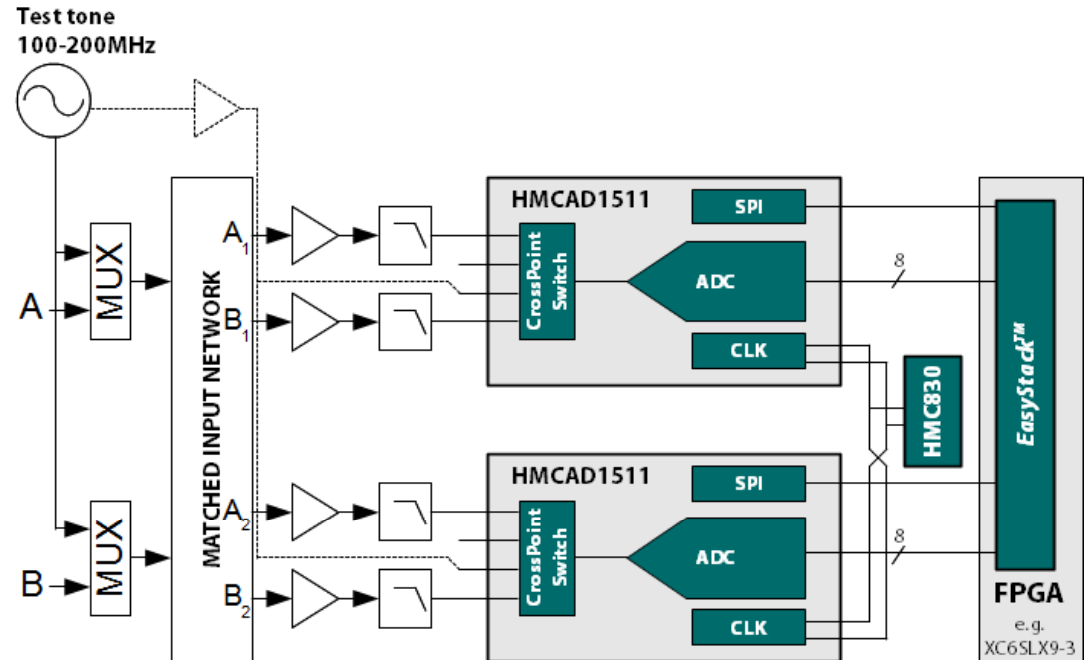
Low Cost FPGA

- ✓ *2X HMCAD1511 at 1GSPS can operate with*
    - ✓ *Xilinx Spartan-6 (XC6SLX9-3) w/Ext. Memory*
    - ✓ *Xilinx Spartan-6 (XC6SLX4-3) wo/Ext. Memory*

Hittite *EasyStack™* FPGA Firmware stack

- ✓ *LVDS RX and Data Deserialization*
- ✓ *SPI Control Interface*

Test tone

- ✓ *Synchronization*
- ✓ *Time Skew compensation*
- ✓ *Low cost Oscillator (100 to 200MHz)*
    - ✓ *MUX before matched input network or*
    - ✓ *Buffer and insert input unused ADC input*

February 27, 2012

Analog input network considerations

✓ *ADC driver output impedance*
  - ✓ *To achieve 200MHz analog bandwidth: 80Ω*
✓ *Low Cost single ended ADC driver can be used in conjunction with ADC digital gain*
  - ✓ *Reduced swing due to single ended input compensated with digital gain*
✓ *Compact (7*7mm) package allows short traces on PCB*
  - ✓ *Ensures low mismatch between ADCs*

HMCAD1511 and HMCAD1510 offers wide range digital Gain

✓ *Internal 13-bit resolution allows wide range digital gain*
  - ✓ *SNR > 46dB up to 16X-gain*
  - ✓ *SNR > 49dB up to 5X-gain*
  - ✓ *No missing codes up to 32X-gain*
✓ *Digital gain can be used to replace Analog gain*
  - ✓ *Reduced system cost*
  - ✓ *Low-cost, single-ended ADC drivers*

HMCAD1511 SNR vs Digital Gain

Compared with ideal 8-bit ADC
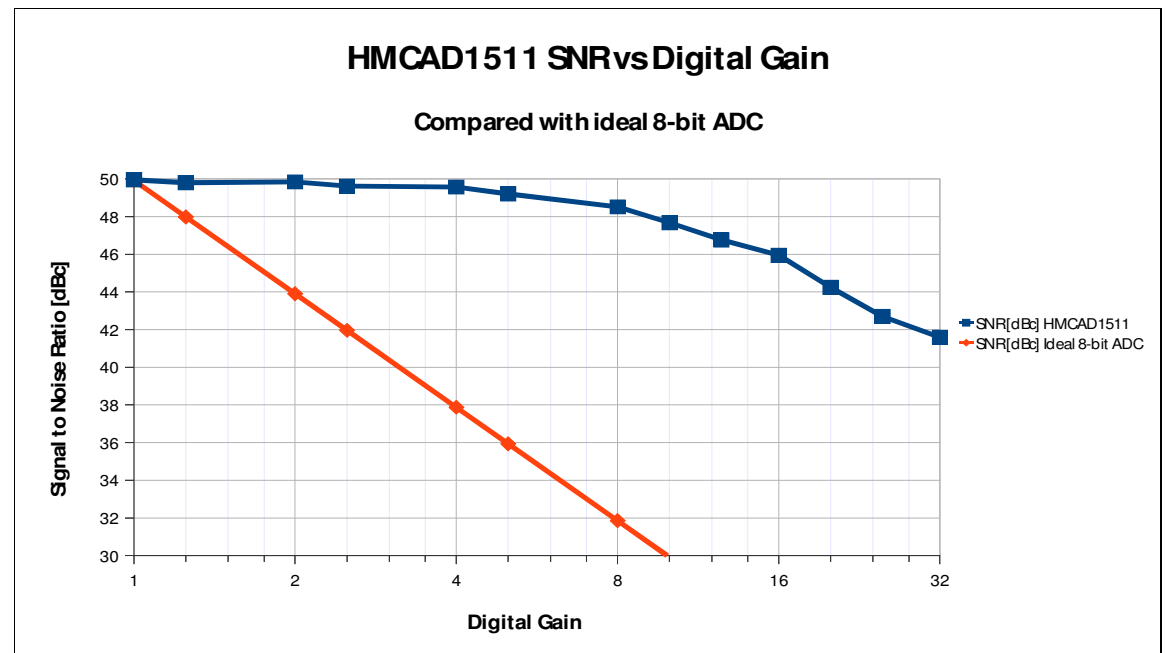
HMCAD1511 in 2GSPS Oscilloscope solution

✓ *2X HMCAD1511 is an excellent choice for 2GSPS operation*
  ✓ *Wide range digital gain allows low cost single ended drivers*
  ✓ *Internal Cross Point Switch can eliminate external switches*
  ✓ *Compact ADC allows short PCB traces and ensures good matching*
  ✓ *Low power ADC: No need for thermal management (fan)*