

Highest Performance, Lowest Power Dual 10-bit 1 GSPS Space-Qualified ADC

ADC10D1000 Delivers Sampling Rates up to 1 GSPS in Dual, or 2 GSPS in Single Channel Modes

The ADC10D1000 is the latest advance in National's ultra-high-speed Analog-to-Digital Converter (ADC) family of products. This low-power, high-performance CMOS analog-to-digital converter digitizes signals at 10-bit resolution at sampling rates of up to 1.0 GSPS in dual channel mode or 2.0 GSPS in single channel mode. The ADC10D1000 achieves excellent accuracy and dynamic performance while consuming a typical 1.45W/channel of power. This space-grade, radiation-tolerant ADC is single event latch immune to 120 MeV and a Total Ionizing Dose (TID) of 100 krad(Si). The product is packaged in a hermetic 376 column thermally enhanced CCGA package rated over the temperature range of -55°C to +125°C.

The ADC10D1000 builds upon the features, architecture and functionality of the 8-bit GSPS family of ADCs. The unique folding and interpolating architecture, the fully differential comparator design, the innovative design of the internal track-and-hold amplifier and the self-calibration scheme enable a very flat response of all dynamic parameters beyond Nyquist, producing a high 8.9 Effective Number of Bits (ENOB) with a 498 MHz input signal and a 1.0 GHz sample rate while providing a 10^{-18} Code Error Rate (CER). Consuming a typical 1.45W/channel in Demultiplex Mode at 1.0 GSPS from a single 1.9V supply, this device is guaranteed to have no missing codes over the full operating temperature range.



Each channel has its own independent DDR Data Clock, DCLKI and DCLKQ, which are in phase when both channels are powered up, so that only one Data Clock could be used to capture all data, which is sent out at the same rate as the input sample clock. If the 1:2 Demultiplexed Mode is selected, a second 10-bit LVDS bus becomes active for each channel, such that the output data rate is sent out two times slower, but two times wider to relax data-capture timing margin. The two channels (I and Q) can also be interleaved (DES Mode) and used as a single 2.0 GSPS ADC to sample on the Q input. The LVDS output formatting is offset binary or two's complement.

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Features

- Excellent accuracy and dynamic performance
- Low power consumption
- Read/Write SPI Interface for Extended Control Mode
- Internally terminated, buffered, differential analog inputs
- Ability to interleave the two channels to operate a single 2 GSPS ADC
- Test patterns at output for system debug
- Programmable 15-bit gain and 12-bit plus sign offset adjustments
- Option of 1:2 demuxed or 1:1 non-demuxed LVDS outputs
- Auto-sync feature for multi-chip systems
- Single 1.9V+0.1V power supply
- 376 Ceramic Column Grid Array package (28.2mm x 28.2mm x 3.1mm with 1.27mm ball pitch)

Applications

- Data acquisition systems
- Wideband communications
- Direct RF down conversion

Performance

- Resolution: 10 bits
- Conversion
 - Dual channels at 1.0 GSPS
 - Single channel at 2.0 GSPS
- Code Error Rate: 10^{-18}
- 9.0 bits ENOB, at $F_s=1.0$ GSPS, $F_{in} = 248$ MHz
- 56.8 dBc SNR, at $F_s=1.0$ GSPS, $F_{in} = 498$ MHz
- 62 dBc SFDR, at $F_s=1.0$ GSPS, $F_{in} = 498$ MHz
- 2.8 GHz full-power bandwidth
- +/- 0.7 LSB INL
- Radiation performance
 - 100 krad(Si) total ionizing dose
 - Single event latch up immune to 120 MeV
- Power consumption
 - Single-channel enabled: 1.64W
 - Dual-channels enabled: 2.90W
 - Power-down mode: 55 mW

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Ordering Information

| Part Number | Package Number | Package Description |
|-----------------|----------------|-------------------------------|
| ADC10D1000CCMLS | CCC376A | 376 Ceramic Column Grid Array |
| ADC10D1000CC-QV | CCC376A | 376 Ceramic Column Grid Array |
| ADC10D1000CCFQV | CCC376A | 376 Ceramic Column Grid Array |