ADC12Dxx00RF Direct RF-Sampling ADCs Sample Beyond 2.7 GHz at up to 3.6 GSPS

Breakthrough RF-Sampling ADCs Revolutionize Radio Architectures

National's 12-bit direct RF-sampling ADCs can directly sample input frequencies up to and beyond 2.7 GHz at up to 3.6 GSPS. A single direct RF-sampling ADC can replace an entire IF-sampling or ZIF-sampling radio signal path subsystem of mixers, LO synthesizers, amplifiers, filters, and ADCs, drastically reducing bill of materials (BOM) cost, design time, and board size, weight, and power. A wide array of applications such as 3G/4G wireless basestations, microwave backhaul, military, and wideband software-defined radio (SDR) can now achieve the benefits that RF-sampling provides.

The ADC12Dxx00RF family of ADCs improves upon National's existing 12-bit GSPS ADC products by expanding the frequency range over which National's superior dynamic range can be realized. The ADC12Dxx00RF delivers its excellent noise and linearity performance at RF frequencies beyond the 7th Nyquist zone. These five new ADCs are available in speed grades ranging from dual-channel 500 MSPS to single-channel 3.6 GSPS. They are pin-compatible with National's ADC12D1x00 and ADC10D1x00 families, enabling system designers to reuse a single design for multiple speed and resolution combinations.

<table>
<thead>
<tr>
<th>Product ID</th>
<th>Sampling Rate Single/Dual-Channel (MSPS)</th>
<th>Power (W)</th>
<th>IMD3 @ 2.7 GHz (dBFS)</th>
<th>Noise Floor (dBm/Hz)</th>
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<tbody>
<tr>
<td>ADC12D500RF</td>
<td>1000 / 500</td>
<td>2</td>
<td>-69</td>
<td>-150.5</td>
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<tr>
<td>ADC12D800RF</td>
<td>1600 / 800</td>
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<td>-69</td>
<td>-154</td>
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<td>ADC12D1600RF</td>
<td>3200 / 1600</td>
<td>4</td>
<td>-70</td>
<td>-154.6</td>
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<td>ADC12D1800RF</td>
<td>3600 / 1800</td>
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<td>-155</td>
</tr>
</tbody>
</table>

RF Sampling A/D Converters

National's Direct RF-Sampling Solution

- Integrated Solution
- Reduced Size, Weight, & Power
- Increased Programmability & Scalability

Simplified Block Diagram

Traditional IF-Sampling

Traditional ZF-Sampling
Unparalleled Performance

Industry's best dynamic performance at 2.7 GHz and beyond
Footprint-compatible family from 500 MSPS to 3.6 GSPS
- Reduce design time and cost and make future upgrades easy by reusing designs at different speed grades
Footprint-compatible with National's ADC12D1x00 and ADC10D1x00
- Enable design reuse for different dynamic range requirements
Industry's largest Nyquist zone of up to 1.8 GHz
- Enable truly wideband software-defined radio (SDR)
Combine multiple wideband and narrowband channels into a single ultra wideband channel
New interleaved mode more than doubles useable input frequency range
- Sample higher input frequencies with higher resolution than previously possible

RF-Sampling A/D Applications

The RF-sampling ADC family replaces multiple analog components with a single chip, reducing system cost, size, weight, and power, and saving design time. In addition, their excellent performance over a large range of input frequencies up to and beyond 2.7 GHz enables maximum frequency, bandwidth, and overall system programmability and flexibility in many applications including software-defined radio (SDR) and digital pre-distortion (DPD) in LTE/UMTS basestations, radar, lidar, and signal intelligence (SIGINT).

Basestations
Allows direct RF-sampling in 3G/4G receive and digital pre-distortion (DPD) signal paths
Replace entire IF-sampling and ZIF-sampling subsystems of mixers, LO-synthesizers, amplifiers, filters, and ADCs
1.8 GHz Nyquist zone enables ultra-wideband and multiband radio designs

Microwave Backhaul
Enable higher data capacity backhaul link – industry's largest Nyquist zone and best performance beyond 2.7 GHz allows for higher-order modulation over channel bandwidths of at least 1.25 GHz
RF-sampling capability enables ODU and IDU integration by eliminating entire IF-sampling and ZIF-sampling subsystems
RF-sampling capability eliminates multiple frequency down-conversion stages

Software-Defined Radio and Military
Replace multiple frequency down-conversion stages and combine multiple narrowband and wideband channels into a single ultra wideband channel
Excellent noise and linearity performance beyond 2.7 GHz and industry's largest Nyquist zone enable digital implementation of filters and mixers, allowing for on-the-fly programming of bandwidth and frequency to maximize system agility and flexibility

Test & Measurement
Enable higher bandwidth scopes and higher resolution, larger bandwidth real-time spectrum analyzers (RTSA)
Enable higher linearity analyzers

RF Sampling ADC Resources
Software Defined Radio: Don't Talk to Me About ENOBs (article)
Software-Defined Radio (SDR) Information
WaveVision 5 Software: Data Acquisition & Analysis Tool
Gigasample ADC Eval Boards
IBIS Models

Related Products
Data Converters
- Ultra High-Speed Gigasample ADCs
Software-Defined Radio (SDR) Architecture
Amplifiers
Clock & Timing Solutions (Clock Jitter Cleaners, PLLs)
Other RF/IF ICs
Wireless Infrastructure Solutions