

# ADC12Dxx00RF Direct RF-Sampling ADC Family



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

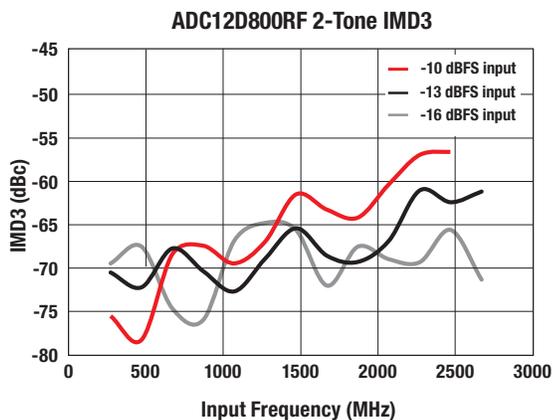


## Breakthrough Direct RF-Sampling ADCs Revolutionize Radio Architectures

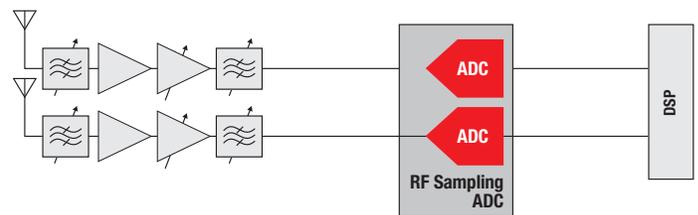
Texas Instruments' 12-bit direct RF-sampling ADCs can directly sample input frequencies up to and beyond 2.7 GHz at up to 3.6 GSPS. A single direct RF-sampling ADC can replace an entire IF-sampling and ZIF-sampling radio signal path subsystem of mixers, LO synthesizers, amplifiers, filters, and ADCs, drastically reducing bill of materials (BOM) cost, design time, board size, weight, and power. A wide array of applications such as 3G/4G wireless base stations, 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 TI's existing 12-bit GSPS ADC products by expanding the frequency range over which TI'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 ADCs are available in speed grades ranging from dual-channel 500 MSPS to single-channel 3.6 GSPS. They are pin-compatible with TI's ADC12D1x00 and ADC10D1x00 families, enabling system designers to reuse a single design for multiple speed and resolution combinations.

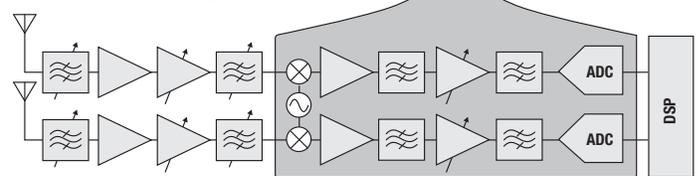
## Unparalleled Performance



TI's RF-Sampling Solution



Traditional IF-Sampling



## Key Product Features

- Industry's best dynamic performance at 2.7 GHz and beyond
- Pin-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
- Pin-compatible with TI's ADC12D1x00 and ADC10D1x00
  - Enable design reuse for different dynamic range requirements
- Industry's largest high-resolution Nyquist zone of 1.8 GHz
  - Enable wideband SDR
  - Combine multiple wideband and narrowband channels into a single ultra-wideband channel
- New interleaved mode more than doubles useable frequency range
  - Sample higher input frequencies with higher resolution than previously possible

# ADC12Dxx00RF Direct RF-Sampling ADC Family

## Key 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 enables maximum frequency, bandwidth, and overall system programmability and flexibility in many applications including:

### Base stations

- 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

### 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 high-resolution Nyquist zone of up to 1.8 GHz 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

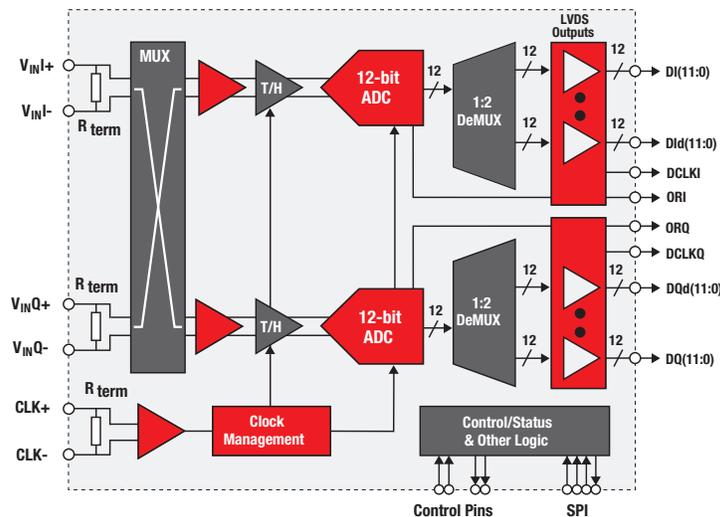
## Microwave Backhaul

- Enable higher data capacity backhaul link – industry's largest high-resolution Nyquist zone of up to 1.8 GHz 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

## ADC12Dxx00RF Family of Products

| Device       | Sampling Rate Single-/Dual-Channel (MSPS) | Power (W) | IMD3 @ 2.7 GHz (dBc) | Noise Floor (dBm/Hz) |
|--------------|---|-----------|----------------------|----------------------|
| ADC12D500RF  | 1000/500                                  | 2.0       | -69                  | -150.5               |
| ADC12D800RF  | 1600/800                                  | 2.5       | -71                  | -152.2               |
| ADC12D1000RF | 2000/1000                                 | 3.5       | -69                  | -154                 |
| ADC12D1600RF | 3200/1600                                 | 4.0       | -70                  | -154.6               |
| ADC12D1800RF | 3600/1800                                 | 4.4       | -64                  | -155                 |

ADC12Dxx00RF Simplified Block Diagram



**Important Notice:** The products and services of Texas Instruments Incorporated and its subsidiaries described herein are sold subject to TI's standard terms and conditions of sale. Customers are advised to obtain the most current and complete information about TI products and services before placing orders. TI assumes no liability for applications assistance, customer's applications or product designs, software performance, or infringement of patents. The publication of information regarding any other company's products or services does not constitute TI's approval, warranty or endorsement thereof.

The platform bar is a trademark of Texas Instruments.

All other trademarks are the property of their respective owners.

© 2012 Texas Instruments Incorporated

Printed in U.S.A. by Almaden Press, San Jose, CA



## IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

### Products

|                        |  |
|------------------------|--|
| Audio                  | <a href="http://www.ti.com/audio">www.ti.com/audio</a>                               |
| Amplifiers             | <a href="http://amplifier.ti.com">amplifier.ti.com</a>                               |
| Data Converters        | <a href="http://dataconverter.ti.com">dataconverter.ti.com</a>                       |
| DLP® Products          | <a href="http://www.dlp.com">www.dlp.com</a>   |
| DSP                    | <a href="http://dsp.ti.com">dsp.ti.com</a>   |
| Clocks and Timers      | <a href="http://www.ti.com/clocks">www.ti.com/clocks</a>                             |
| Interface              | <a href="http://interface.ti.com">interface.ti.com</a>                               |
| Logic                  | <a href="http://logic.ti.com">logic.ti.com</a>                                       |
| Power Mgmt             | <a href="http://power.ti.com">power.ti.com</a>                                       |
| Microcontrollers       | <a href="http://microcontroller.ti.com">microcontroller.ti.com</a>                   |
| RFID                   | <a href="http://www.ti-rfid.com">www.ti-rfid.com</a>                                 |
| OMAP Mobile Processors | <a href="http://www.ti.com/omap">www.ti.com/omap</a>                                 |
| Wireless Connectivity  | <a href="http://www.ti.com/wirelessconnectivity">www.ti.com/wirelessconnectivity</a> |

### Applications

|                               |  |
|-------------------------------|--|
| Automotive and Transportation | <a href="http://www.ti.com/automotive">www.ti.com/automotive</a>                         |
| Communications and Telecom    | <a href="http://www.ti.com/communications">www.ti.com/communications</a>                 |
| Computers and Peripherals     | <a href="http://www.ti.com/computers">www.ti.com/computers</a>                           |
| Consumer Electronics          | <a href="http://www.ti.com/consumer-apps">www.ti.com/consumer-apps</a>                   |
| Energy and Lighting           | <a href="http://www.ti.com/energy">www.ti.com/energy</a>                                 |
| Industrial                    | <a href="http://www.ti.com/industrial">www.ti.com/industrial</a>                         |
| Medical                       | <a href="http://www.ti.com/medical">www.ti.com/medical</a>                               |
| Security                      | <a href="http://www.ti.com/security">www.ti.com/security</a>                             |
| Space, Avionics and Defense   | <a href="http://www.ti.com/space-avionics-defense">www.ti.com/space-avionics-defense</a> |
| Video and Imaging             | <a href="http://www.ti.com/video">www.ti.com/video</a>                                   |

TI E2E Community Home Page

[e2e.ti.com](http://e2e.ti.com)

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265  
Copyright © 2012, Texas Instruments Incorporated