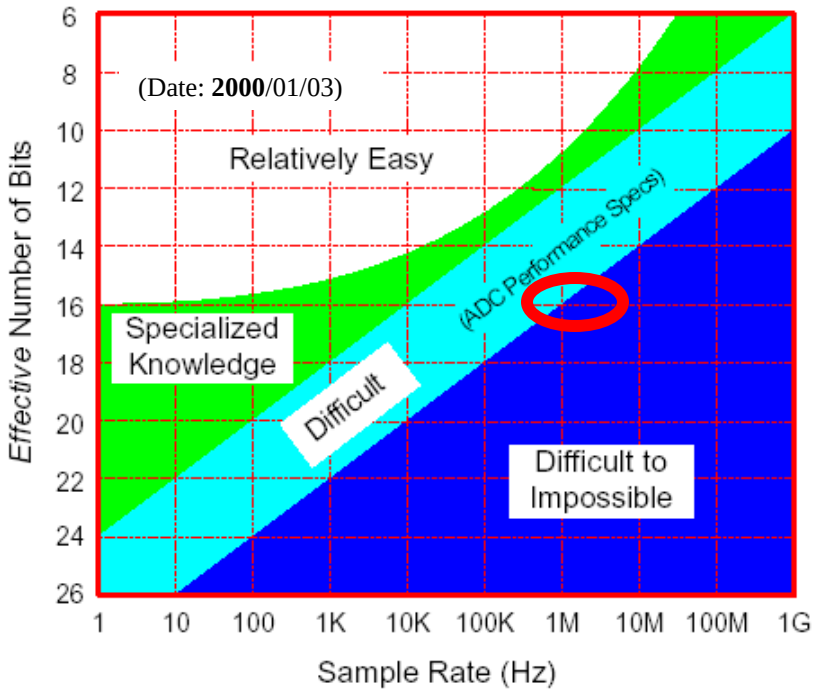
16-Bit, ≥1 MSPS A/D Converters



Ref: "Practical Limits of Analog-to-Digital Conversion" (Jerry Horn)

AD10677	16 Bit, 65 MSPS A/D Converter
AD10678	16 Bit, 80 MSPS A/D Converter
AD7653	16-Bit 1 MSPS PulSAR?® Unipolar ADC with Ref
AD7655	Low Cost, 4-Channel, 1 MSPS 16-Bit PulSAR?® A/D Converter
AD7667	16-Bit, 1 MSPS PulSAR?® Unipolar ADC with Ref
AD7671	16-Bit 1 MSPS Bipolar PulSAR?® ADC
AD7677	16-Bit, 1 LSB INL, 1 MSPS Differential PulSAR?® ADC
AD7723	16-Bit, 1.2 MSPS, CMOS Sigma-Delta ADC
AD7725	16-Bit Sigma Delta ADC with a Programmable Post Processor
AD9260	16-Bit High Speed Oversampled A/D Converter
ADC16061	Self-Calibrating 16-Bit, 2.5 MSPS, 390 mW A/D Converter
ADS1605	16-bit, 5 MSPS Delta-Sigma, Analog-to-Digital Converter
ADS1606	16 Bit, 5 MSPS Single Channel Delta-Sigma ADC Single with FIFO
ADS8401	16 Bit 1.25 MSPS Parallel ADC W Ref
ADS8402	16 bit 1.25 MSPS Parallel ADC W/Ref, Unipolar Differential Input
ADS8411	16-Bit, 2 MSPS ADC with P8/P16 Parallel Output, Internal Clock & Internal Reference
ADS8412	16 Bit 2 MSPS Parallel ADC W/Ref, Unipolar Differential Input
MAX1200	+5V Single-Supply, 1 Msps, 16-Bit Self-Calibrating ADC
SPT8100	16-bit, 5 MSPS CMOS ADC

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http://www.chipcatalog.com/Cat/278.htm (Date: **2004**/05/09)

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acquisitionZONE Products for the week of August 29, 2005

Texas Instruments Says . . .

ADS1610: 16-Bit, 10-Msample/s Delta-Sigma ADC for Precision Measurements

Offers 86-dB SNR and 95-dB SFDR at 4x the Speed of Nearest Competition

Providing an unmatched combination of speed and precision, Texas Instruments Incorporated (TI) announced a 16-bit, 10MSPS delta-sigma analog-to-digital converter (ADC). Featuring 86dB signal-to-noise ratio (SNR) and 95dB spurious-free dynamic range (SFDR) over a 5MHz bandwidth, the ADS1610 provides state-of-the-art performance at 4x the speed of the nearest delta-sigma competition and 2x the speed of TI's previous delta-sigma solutions. The ADS1610 is ideal for demanding measurements in communications, scientific instrumentation and test and measurement applications.

"Texas Instruments has leveraged its expertise in high-performance data conversion to once again push the boundaries in speed and precision," said Gregg Lowe, senior vice president of TI's high-performance analog business. "This breakthrough data converter extends our industry-leading portfolio of delta-sigma ADCs and provides our customers with outstanding high-speed performance for their most demanding measurement applications."

The high-speed operation (10MSPS) is ideal for high-accuracy applications requiring higher sampling speeds. The 16-bit resolution with 86dB SNR, 95dB SFDR and -94dB total harmonic distortion (THD) is ideal for high-speed applications requiring higher accuracy signal measurement.

analogZONE Says . . .

I continue to be extremely impressed with this family of parts. It is tempting to say just read our previous review of the ADS1605 and double the clocking rate, or look at the 18-bit 1.25 Msample/s cousin in the form of the ADS1625, but that would not be doing this part enough justice, or courtesy.

Apart from the clock speed other things have changed. Power consumption has not doubled with speed although it has increased from 110 mA to 150 mA on the 5-V analog supply and from 49 mA to 70 mA on the 3-V digital/IO rail. And with a change in the oversampling ratio from 8x to 6x there are minor changes in the dynamic numbers that are difficult to corelate between the parts. The signal bandwidth has increased to 4.9 MHz (from 2.45 MHz) wth the 0.1 dB bandwidth now at 4.6 MHz; but the most astonishing change is in the filter ripple characteristic with the passband at 4.4 MHz and a ripple of ±0.0002 dB. That's right, three zeroes after the decimal point!

Little else needs to be said. TI is introducing the ADS1610 at a lower price than the ADS1605

introduction (and it is still priced at $32.05 on TI's web site, though not for long one suspects) and is a pin compatible upgrade to the earlier part. It will do extremely well.

The ADS1610 is sampling in TQFP-64 and will be priced at $29.95 in 1000-piece lots when production starts in Q3 2005. Although the news release does not say it, the part will also be available in QFN-64. Evaluation modules are available.

Data Sheet

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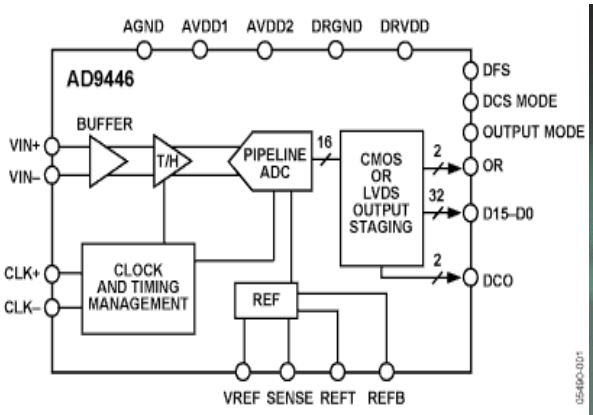
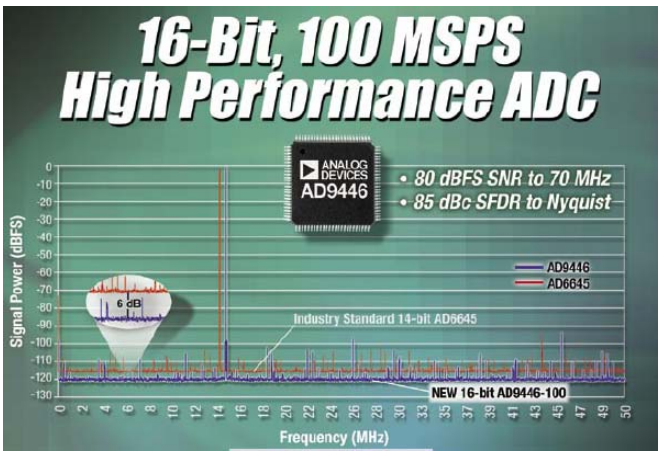
Norwood, MA (5/9/2005) - Analog Devices, Inc. (NYSE:ADI) the world leader in data converter technology, today introduced the industry's first **16-bit** analog-to-digital converter (ADC) to deliver **100-MSPS** (mega-samples-per-second) data rates while offering both best-in-class signal-to-noise ratio (SNR) and spurious-free dynamic range (SFDR).

AD9446 - 16-Bit, 80 MSPS / 100 MSPS A/D Converter





Features

- 100 MSPS guaranteed sampling rate
- 100 dB two-tone SFDR with 30 MHz and 31 MHz
- **81.6 dB SNR with 30 MHz input** (3.2 Vp-p input, 80 MSPS)
- **90 dBc SFDR with 30 MHz input** (3.2 Vp-p input, 80 MSPS)
- Excellent linearity DNL = ±0.5 LSB typical INL = ±3.0 LSB typical
- 2.3 W power dissipation
- 3.3 V and 5 V supply operation
- 2.0 V p-p to 3.2 V p-p differential full-scale input
- **LVDS outputs (ANSI-644 compatible) or CMOS outputs**
- Data format select (Offset Binary or 2's compliment)
- Output clock available

http://www.analog.com/en/prod/0%2C2877%2CAD9446%2C00.htmlT

LTC News for Immediate Release
For more information, tel. 408-432-1900
John Hamburger, Dir., Mkting Communications, ext. 2419
Doug Dickinson, Media Relations Mgr., ext. 2233
www.linear.com

16-bit, 130Msps ADC Delivers 100dBc SFDR for High Performance Receivers & Instrumentation

Fastest 16-Bit ADC Enables Leading Edge Development for Applications Demanding the Highest Dynamic Range Specifications

MILPITAS, CA – September 6, 2005 – A new 16-bit, 130Msps ADC (Analog-to-Digital Converter) by Linear Technology Corporation extends the company's leadership in high speed (ADCs) for the most demanding wideband, low noise, signal acquisition applications. The LTC2208 ADC addresses the key requirements for maximizing performance of high sensitivity receivers and data acquisition systems. The device's exceptional spurious free dynamic range (SFDR) performance of 100dBc, combined with 78dB signal to noise ratio (SNR), enable it to resolve low level signals in the presence of large interferers and blockers. The LTC2208 is the fastest 16-bit, high performance ADC on the market today.

The LTC2208 family innovates ADC technology for digital receivers by incorporating two unique features that simplify receiver design and improve system performance. The first is an internal transparent dither circuit that improves the ADC's spurious free dynamic range (SFDR) response well beyond 100dBc for low level input signals. The second feature is a digital output randomizer that dramatically reduces unwanted tones caused by digital feedback. The flexible digital outputs can be run as CMOS or LVDS.

The LT2208 also features a programmable gain amplifier (PGA) front end that eases the ADC driver output power requirements when driving the lower input range of 1.5 Vp-p. This improves the distortion performance and power consumption of the driver with minimal impact on ADC noise performance.

(more...)

The LTC2208 packages an extensive feature set in a 9mm x 9mm QFN package delivering low power consumption at 1250mW without the need for heat sinking. Most importantly, both the power consumption and total solution size with integrated bypass capacitance are less than half that of the nearest competitor. Designed for ease of use, it requires only a single 3.3V supply for operation and comes with a clock duty cycle stabilizer for maintaining the ADC performance over varying duty cycles. The LTC2208 can accept high frequency, wide dynamic range signals, offering a wide analog input bandwidth of 700MHz.

The LTC2208 family includes speed grades of 130Msps, 105Msps, 80Msps, 65Msps, 40Msps, 25Msps and 10Msps all with superior SFDR and SNR performance. In addition to the 16-bit parts, 14-bit versions of this family will also be available. All devices are supported with demo boards for quick device evaluation. Samples and demo boards for the LTC2208 are available today, and production quantities in October for both commercial and industrial temperature grades and are competitively priced at $65 each in 1,000-piece quantities.

The following table provides the entire LTC2208 product family. All parts can be ordered in optional lead free packages for RoHS compliance.

Part Number	Resolution	Speed	Power	Availability	Price (1k)
LTC2208	16-bit	130Msps	1250mW	**Now**	**$65.00**
LTC2207	16-bit	105Msps	850mW	Oct	$56.67
LTC2206	16-bit	80Msps	640mW	Oct	$48.33
LTC2205	16-bit	65Msps	450mW	Oct	$43.33
LTC2204	16-bit	40Msps	350mW	Oct	$35.00
LTC2203	16-bit	25Msps	220mW	Oct	$30.00
LTC2202	16-bit	10Msps	150mW	Oct	$25.00
LTC2208-14	14-bit	130Msps	1250mW	Nov	**$55.00**
LTC2207-14	14-bit	105Msps	850mW	Nov	$45.00
LTC2206-14	14-bit	80Msps	640mW	Nov	$33.00
LTC2205-14	14-bit	65Msps	450mW	Nov	$28.00

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The first stop for the latest ICs and components

Fast 16-bit A/D converter fits comm's bill

By Bettyann Liotta, eeProductCenter
Sep 8 2005 (0:10 AM)
URL: http://www.eeproductcenter.com/showArticle.jhtml?articleID=170701333

Sunnyvale, Calif. — Maxim Integrated Products Inc. said it's setting a new industry standard in dynamic performance with its fastest (80 Megasamples/second) 16-bit analog-to-digital converter yet.

The MAX19586 offers superior dynamic performance including a noise floor of -82 dBfs, 80 dB SNR, and 96 dBc spurious-free dynamic range (SFDR) at an input frequency of 10 MHz (-2 dB input amplitude), said Ted Tewksbury, managing director of Maxim's high-speed signal processing business unit.

This performance is several dBs better than the competition in noise floor, SNR, and SFDR, Tewksbury said. It can also sample input frequencies beyond 170 MHz.

"Maxim leveraged its leadership data-converter technology to produce a high-speed ADC that advances the state of the art along both the dynamic performance and power axes," Tewksbury said. "This remarkable performance is achieved at half the power required by

the nearest competitor in a package that is one quarter the size."

The MAX19586 is a 3.3 V A/D converter with a fully differential wideband track-and-hold (T/H) and a 16-bit converter core. Not only designed for excellent operation in the 2nd Nyquist region, the MAX19586 is also optimized for use with high-IF input frequencies. This makes the part suited for high-performance digital receivers. The part has a 1.8-V digital supply voltage and a 2.56-V peak-to-peak full-scale input range.

"It is one thing to advance dynamic performance, but it is another thing to do that at almost half the power," said Maher Matta, business manager for the company's high-speed converter products. At 1.1 W power dissipation, the MAX19586 uses 48 percent less power than the nearest competitor. This part is also packaged in a space-saving 56-pin QFN-EP, one fourth the size of that same competitor. This device is specified for the -40°C to +85°C industrial temperature range.

The performance of the MAX19586 is said to make it practical for high-performance broadband applications. Applications include cellular base-station transceiver systems (BTS), multicarrier and multistandard communication receivers, E911 location receivers, antenna array processing, and high-end test and measurement instrumentation.

 See related FFT chart

The MAX19586 provides the best combination of SNR and SFDR in the industry, according to Maxim. This allows system engineers to design communication receivers with extra sensitivity and aids the design of multicarrier receivers. The excellent 96 dBc SFDR performance eases filtering requirements, and less expensive filters reduce system costs. The large dynamic range can also be utilized to simplify system design by eliminating the need for variable gain attenuators (VGA) or automatic gain control (AGC) blocks in the receiver. This is especially important in systems where the receiver is expected to digitize both weak and strong signals. With over 80 dB of dynamic range, the system can capture both signals without having to change gain ranges.

In subsampling applications, the MAX19586 offers superior performance at high IF (77.2 dB SNR at an input frequency of 168 MHz), which allows system designers to eliminate RF down-conversion stages without sacrificing overall system performance. In instrumentation applications, the superb noise floor will quickly yield instruments with more measurement sensitivity than before.

 See related SNR vs. Analog Input chart

The MAX19586 is available today. Pricing is $59.25 (1000-up, FOB USA). Click here for the MAX19586 data sheet.

Maxim, 1-800-998-8800, www.Maxim-ic.com.

The 16-bit monolithic high-speed converter market is heating up — In addition to Maxim's MAX19586 unveiling, there have been two other recent announcements from Analog Device Inc. (Norwood, Mass.) and Linear Technology Corp. (Milpitas, Calif.)

 See Maxim block diagram

While Linear Tech's LTC2208 clearly offers the highest sampling rate of the three devices at 130 Megasamples/second, Maxim's converter offers solid SNR and SFDR performance. Maxim's MAX19586 is the first device in a new family — higher-speed versions will soon follow, Maxim's Matta said.

All of these A/D converters are intended for use in demanding wideband communications applications, especially basestation receivers, as well as instrumentation and some other high-end type applications.

Cellular basestations have evolved from supporting voice only to supporting data and video also, which requires the receiver to have additional capacity. "The dB advantage we have will increase receiver sensitivity and enable our product to support multicarrier receivers," Matta said.

Instrumentation applications also require strong dynamic performance to resolve small signals. "Our A/D converter will result in instruments that have more sensitivity, which will enable them to measure smaller signals," Matta said.

It's also important to note that Maxim's MAX19586 includes an integrated buffer on the front end — which does effect power consumption (1.1 W). "Integrated buffers make it easier to drive the A/D converter depending on input frequency and the topology of the input network — but it results in additional power consumption," Matta said.

On the other hand, if buffers are needed and they aren't included, then you have to figure out a way to drive the sampling converter yourself — with your own external buffer or transformer.

Most companies tend to offer either one version or the other — with or without buffers. However, Maxim is now considering offering one product family in both versions to customers, Matta said.

Linear Technology's LTC2208 includes two unique features that are said to simplify receiver design and boost system performance — an internal transparent dither circuit to improve the converter's SFDR response beyond 100 dBc, and a digital output randomizer to reduce unwanted tones caused by digital feedback.

LTC's A/D converter delivers 78 dB SNR and 100 dBc SFDR at 10 MHz.

Click here too see more details on LTC's LTC2208 at eeProductCenter.

ADI ranks second in terms of speed at 100 Msamples/s (AD9446) with SNR of 76 dB and SFDR of 90

dBc at 10 MHz. The company also has an 80 Msamples/s A/D converter that achieves 82 dBfs SNR and 85 dBc SFDR.

Click here too see more details on ADI's AD9446 at eeProductCenter.

Maxim's MAX19586 and Linear's LTC2208 are available in production quantities now. ADI is expected to offer production quantities next month.

Linear's LTC2208 comes in a 9mm x 9mm QFN and consumes 1,250 mW of power, compared to ADI's AD9446, which is packaged in a 16mm x 16mm TQFP and consumes 2,500 mW of power. Maxim's A/D converter is housed in an 8mm x 8mm, 56-pin TQFN and uses 1.1 W of power.

Linear Tech's LTC2208 and ADI's AD9446 are available in both low-voltage differential signaling (LVDS) and CMOS outputs. Maxim's MAX19586 offers CMOS outputs.

Linear also has a 16-bit, 105 Msamples/s (LTC2207) converter, with 78 dB SNR and 100 dBc SFDR at 10 MHz. It comes in a 7mm x 7mm QFN and consumes only 850 mW.

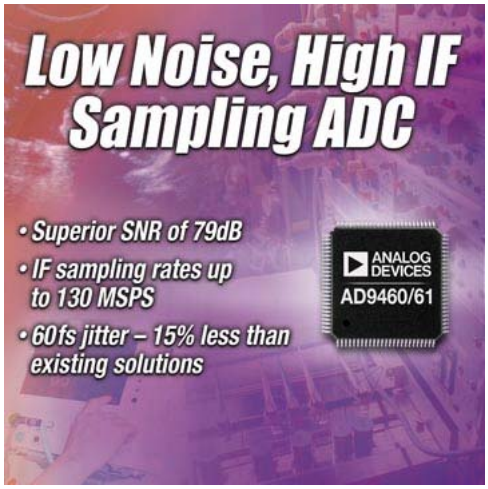
Pricing is $65.00 for LTC's 130 Msample/s device (LTC2208), $56.67 for its 105 Msamples/s version (LTC2207), $79.70 for ADI's AD9446 and $59.25 for Maxim's MAX19586 device — all in 1,000-piece quantities.

Analog Devices, 1-800-262-5643, www.analog.com.

Linear Technology, 1-800-454-6327, www.Linear.com.

ANALOG DEVICES' 16-BIT DATA CONVERTERS ACHIEVE BEST-IN-CLASS SIGNAL-TO-NOISE RATIO AND IF SAMPLING PERFORMANCE

New AD9460 and AD9461 ADCs deliver true 16-bit resolution for instrumentation, radar, medical imaging, and communication systems.



Norwood, MA(3/14/2006) - Analog Devices, Inc. (NYSE: ADI), the world leader in data converter technology, is expanding its portfolio of high-performance analog-to-digital converters (ADCs) with the introduction of two devices targeted for high-end instrumentation, medical and wireless communications applications that enable designers to maintain low noise and high dynamic range, even at high input frequencies. Designers of medical systems, such as magnetic resonance imaging and patient monitoring receivers, which involve complex, multi-channel designs will benefit from the new converters which offer the highest signal to noise ratio (SNR) at 79dB, and deliver 16-bit precision at high IFs (intermediate frequency) and supporting sampling rates up to 130 MSPS (mega samples per second). In addition to an internal buffer that isolates and eases driving of the ADC inputs, the new devices offer 15 percent lower jitter than existing solutions — an important factor in maintaining low system noise floors. The new converters – the AD9460 and AD9461 – provide 16-bit performance up to 130 MSPS, enabling the high dynamic range required for signal analysis, radar, magnetic resonance imaging (MRI), and multi-carrier/multi-std wireless communications systems. In these designs, higher ADC sampling rates allow engineers to capture and digitize wider signal bandwidths and to handle higher Tesla magnetic fields for superior imaging in MRI. In addition, the AD9460 and AD9461 operate with lower power to aide in multi-channel systems. The AD9460, offered at 80 MSPS and 105 MSPS sampling rates, consumes 1.4 W and 1.6 W respectively. At its highest sampling rate of 130 MSPS, the AD9461 consumes 1.9 W.

"System designers are challenged with converter performance trade-offs in order to optimize their dynamic range, speed and power. For devices requiring very high image quality, for example, the need for high sampling rates for faster data capture while maintaining high accuracy and SNR can increase ADC power," said Kevin Kattmann, product line director, high-speed signal processing, Analog Devices. "Leveraging the superior performance of our AD9446, we are able to deliver these higher sampling rate extensions to our 16-bit ADC family at significantly lower power dissipation. The AD9460 and AD9461 offer the wide bandwidth, high speed, exceptional linearity and low noise our customers have come to expect from the AD9446 family."

About the AD9460 and AD9461

The AD9460 and AD9461 ADCs feature an 80dBFS noise floor, SNR of 79db and true 16-bit linearity (DNL = ±0.5 LSB). SFDR is superior at 84dB with an input frequency range of 170MHz-250MHz. Both devices include an integrated input buffer to isolate the ADC input, eliminating the need for external buffering that can consume up to 1 W of power, thereby easing the driving of the ADC, whether driven by transformers or amplifiers.

When input amplifiers are required for signal amplification or single-ended to differential conversion, the AD8138 and AD8139 are ideal for driving the AD9460 and AD9461 at baseband (<100MHz) input frequencies, and the AD8352 serves as an excellent IF-Sampling (>100MHz) input amplifier. The flexible, 2-4Vpp input voltage range of the AD9460 and AD9461 allow designers to optimize SNR and SFDR depending on their sampling rate and input frequency.

The devices join a family of converters designed to deliver exceptional signal noise reduction, high resolution and fast sampling rates. The first device in the family, the AD9446, was introduced last May and released last October.

Pricing and Availability

The AD9460 and AD9461 ADCs are sampling now with production quantities available in March. Available in a Pb-free, 100-lead surface mount plastic package (100-lead TQFP/EP), the AD9460 is priced at $48.33 (80 MSPS) and $56.67 (105 MSPS), and the AD9461 (130 MSPS) is priced at $65.00, each in 1,000-unit quantities.