

High Speed Analog to Digital Converters



...providing exceptional speed/power performance

STMicroelectronics
More Intelligent Solutions



Benefits

All devices are housed in a 7 x 7 mm TQFP48, allowing drop-in compatibility between all resolutions from 8 to 14-bit. All of the products use a pipelined conversion architecture in which each stage has an effective resolution of 1.5 bits, so that the number of stages depends on the resolution required. This architecture provides the best known combination of high conversion speed and low power consumption.

ST's new ADC products perform at every level: Spurious Free Dynamic Range is outstanding at over 70dB and the Signal to Noise and Distortion ratio stays at around 59dB even up to 50Mps (TSA1002). And all at only 50mW (TSA1002) !

Each device employs digital error correction to provide excellent static linearity, works off a single 2.5V supply and has a 2Vpp differential input range.

A built-in voltage reference simplifies circuit design, minimizing external components. Designers can use external references if required. All products are fully compatible with the ST100 and other high speed DSPs.

Evaluation Board



For easy evaluation, please order a demoboard and plug it in your application breadboard.

Suggested Applications

	TSA0801	TSA1001	TSA1002	TSA1201
Portable instrumentation	●	●	●	●
Camcorder	●			
Computer scanner	●			
Digital communication	●	●		●
Video processing		●		
Medical imaging & ultrasound		●	●	●
High resolution fax & scanner		●	●	
High speed DSP interface			●	●
IF sampling				●
Cable modem receiver			●	

High Performance Analog to Digital Converters: Combining High Speed with Ultra Low Power Dissipation

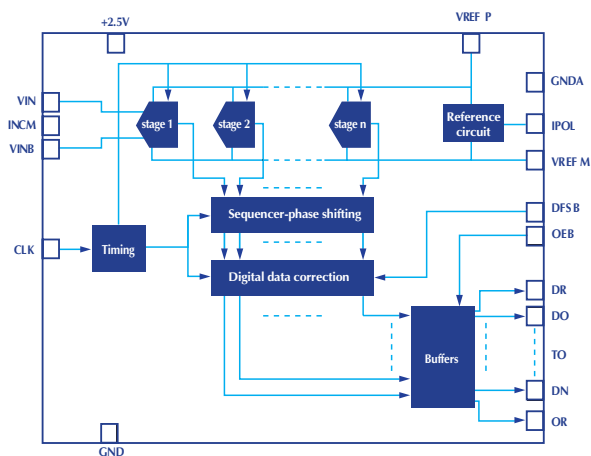
ST participates in markets where its skills and resources can make a significant difference by enhancing the competitiveness of its customers. Although ST has chosen, up until now, not to compete in the stand-alone ADC market, it has nonetheless developed a very high degree of ADC expertise. ST's huge success in the set-top box front-end market would not have been possible without it.

ST's ADC technology, fabricated in 0.25μ CMOS, offers **the optimum speed/power ratio**. Just check the 50MHz/50mW spec of the new 10-bit **TSA1002** against any competitive device.

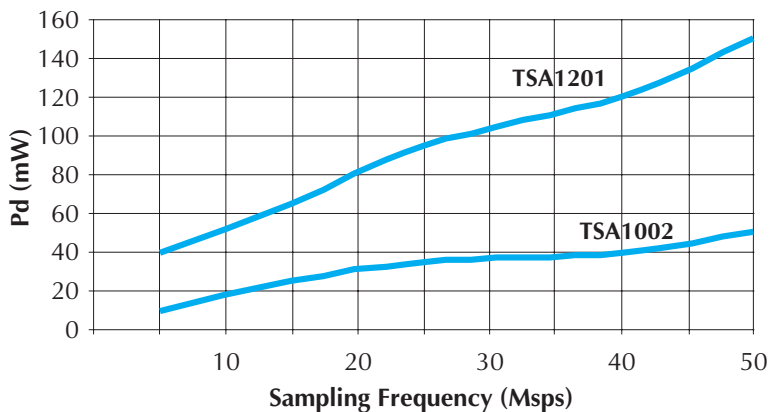
The circuits were designed to be highly cost-effective. What is more, they beat everyone else's stand-alone performance.

The first four standard ADC products offered by ST are 8, 10 and 12-bit devices and other products with up to 14-bit resolution are being designed.

Block Diagram



TSA Family Optimized Power Consumption

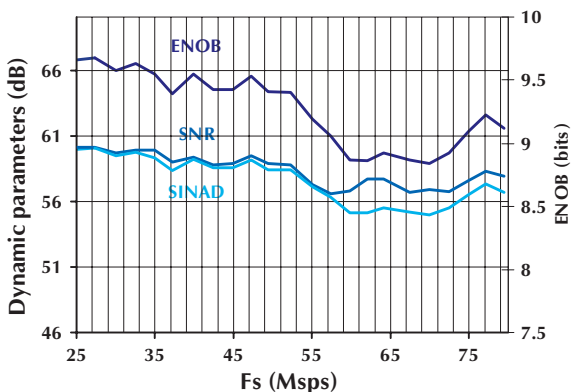


Product Selector

	TSA0801	TSA1001	TSA1002 @Fs=40MSPS	TSA1201
Resolution (bit)	8	10	10	12
Fs (MSPS Max)	40	25	50	50
Consumption (mW typ)	40	35	48	150
Power Supply (V)	2.5	2.5	2.5	2.5/3.3
Effective Resolution Bandwidth (MHz typ)	60	60	60	90
Differential Non Linearity (LSB max)	±0.5	±0.3	±0.7	±0.8
Integral Non Linearity (LSB max)	±1	±0.8	±0.8	±2
SFDR at Fs⁽¹⁾ (dBc typ)	-68	-80.5	-79.2	-77.2
SNR at Fs⁽¹⁾ (dB typ)	48.8	59.3	59.5	64.9
THD at Fs⁽¹⁾ (dB typ)	-72.5	-79.5	-77.8	-74.3
SINAD at Fs⁽¹⁾ (dB typ)	48.7	59	59.4	64.4
ENOB at Fs⁽¹⁾ (bit typ)	7.97	9.7	9.76	10.5
ESD Human Body Model (KV)	2	2	2	2
Data Pipeline Delay (clock cycle)	5.5	5.5	5.5	5.5
Data Bus Interface	parallel	parallel	parallel	parallel
Temperature Range	I,C	I,C	I,C	I
I=Industrial (-40/+85°C) C=Commercial (0/+70°C)				
Package	TQFP48	TQFP48	TQFP48	TQFP48
Unit Price for 1Ku, in USD	2.15	2.95	5.95	17

⁽¹⁾Fin=5MHz for TSA0801/1001/1002 - Fin=15MHz for TSA1201

TSA1002 Linearity versus Sampling Frequency



I_{cca}=20mA
Fin=5MHz

Specified Parameters

Sampling Frequency (Fs)

The Sampling Frequency is expressed in Mega sample per second (Mps).

Effective Resolution Bandwidth (ERB)

The band of input signal frequencies that the ADC converts without losing linearity i.e. the maximum analog input frequency at which the SINAD is decreased by 3dB or the ENOB by 1/2 bit.

Differential Non Linearity (DNL)

The average deviation of any output code width from the ideal code width of 1LSB.

Integral Non Linearity (INL)

An ideal converter presents a transfer function as being the straight line from the starting code to the ending code. The INL is the deviation from this line for each transition.

Spurious Free Dynamic Range (SFDR)

The ratio between the amplitude of fundamental tone (signal power) and the power of the worst spurious signal (not always an harmonic) over the full Nyquist band.

Signal to Noise Ratio (SNR)

The ratio of the rms value of the fundamental component to the rms sum of all other spectral components in the Nyquist band (Fs/2) excluding DC, fundamental and the first five harmonics.

Total Harmonic Distortion (THD)

The ratio of the rms sum of the first five harmonic distortion components to the rms value of the fundamental line.

Signal to Noise and Distortion Ratio (SINAD)

Similar ratio to SNR, but including the harmonic distortion components in the noise figure (not DC signal). From the SINAD, the Effective Number of Bits (ENOB) can be easily deduced:

$$\text{SINAD} = 6.02 \times \text{ENOB} + 1.76 \text{ dB}$$

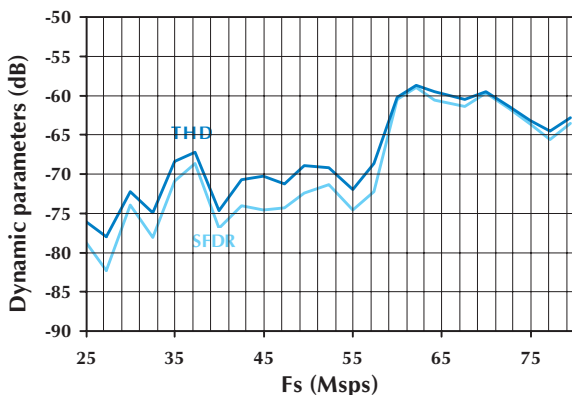
When the applied signal is not Full Scale (FS), but has an A0 amplitude, the SINAD becomes:

$$\text{SINAD} = 6.02 \times \text{ENOB} + 1.76 \text{ dB} + 20 \log (2A0/FS)$$

Data Pipeline Delay

Delay between the initial sample of the analog input and the availability of the corresponding digital data output on the output bus. Also called Data Latency.

TSA1002 Distortion versus Sampling Frequency



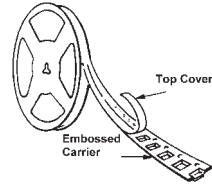
Icca=20mA
Fin=5MHz

Package

Thin Quad Flat Package



TAPE WIDTH (mm)	QTY/REEL (min. order qty)
16	2400



Product Ordering Information

DEVICE	TSA	xx	yy	z	F	T
Family						
Number of bits	08, 10 or 12					
Device number	01 or 02					
Temperature range	I =Industrial (-40/+85°C); C=Commercial (0/+70°C)					
Package	F=TQFP					
Optional Carrier Suffix	T=Tape & Reel (2400p/reel). No suffix=Tray (250p/tray).					

EVALUATION BOARD	EVAL	xx	yy	/AA
Family				
Number of bits	08, 10 or 12			
Device number	01 or 02			
Suffix				

Features, Technologies, Packages: ST has THE Solution for Your Application

ST Standard ICs - Linear and Logic - cover a wide range of devices from the most familiar standard items to more innovative application specific devices.

With ST's Standard Linear and Logic portfolio, you will find the ideal solution.



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Full Product Information at www.st.com

ORDER CODE: FLDATACON/0301

