# Product Brief

SCALINX
THE MIXED-SIGNAL IC COMPANY

## ADX05640DST65

## 5-bit, 640Msps, $\Delta\Sigma$ Modulator

### General Description

The ADX05640DST65 is a 5-bit, 640 MSPS, Continuous-Time (CT) $\Delta\Sigma$ Modulator IP core with 11-bit ENOB up to 40 MHz signal bandwidth and a 3th-order built-in anti-aliasing filter. It is ideally suited for applications that require simultaneously low power while maintaining good dynamic performance at high-speed.

Due to the CT implementation of the $\Delta\Sigma$ modulator, no additional sample and hold (SAH) circuit or input buffer is needed which reduces the silicon area and power consumption of the acquisition chain.
The ADX05640DST65 achieves low noise and low distortion which makes it ideal for multicarrier systems.
Others IP blocks such a voltage reference, PLL, digital decimation filter and high-speed serializer may be used with the ADX05640DST65 to build a complete digitization sub-system.

### Applications

- High-speed data acquisition card
- Communication infrastructure
- Measurement equipment
- Test equipment
- Radar

**STATUS**
**Silicon Proven**

### Benefit and Features

- Process : 65nm CMOS LP/GP (1P7M)
- Output data-rate : 640 MSPS
- Analog bandwidth : 40 MHz
- 11-bit ENOB up to 40 MHz
- Low noise : SNR=69 dB
- Excellent linearity : THD =76.5 dBc
- Low power : 87.3 mW
- 1.6 $V_{pp\_diff}$ input voltage range
- High tolerance to clock jitter
- Very easy to drive
- Resistive input impedance
- Third-order anti-aliasing filter
- -40°C to +125°C junction temperature
- 1.3 $mm^2$ area
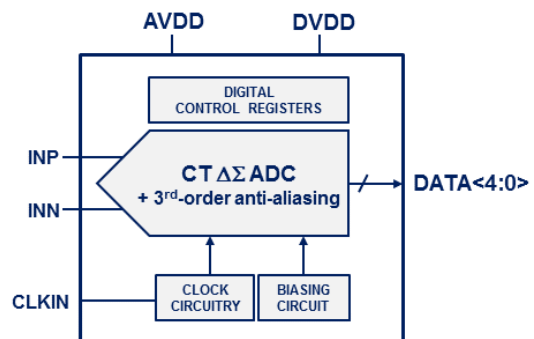- Power down mode

### Functional Diagram



**Figure 1. Functional block diagram**

### Deliverables

- Layout view (GDSII)
- Characterization report
- Behavioral model (Verilog-A)
- Data sheet
- Characterization report
- Integration support

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## Electrical Characteristics*

**(Temp=27°C, AVDD=1.2 V, DVDD=1.0 V, CLKIN=640 MHz, $A_{IN}$=-2.5 dBFS, $V_{ICM}$=0.8 V)**

| PARAMETER | SYMBOL | CONDITIONS | VALUE | UNITS |
|---|---|---|---|---|
| *ANALOG INPUT* | | | | |
| Analog Input Common-Mode | $V_{ICM}$ | | 0.8 | V |
| Differential analog input | $V_{inp}$-$V_{inn}$ | | 1.6 | V |
| *AC CHARACTERISTICS* | | | | |
| Effective Number of Bits | ENOB | $f_{in}$=6 MHz | 11.0 | bit |
| Signal to Noise Ratio | SNR | $f_{in}$=6 MHz | 71.9 | dBFS |
| Total Harmonic Distortion | THD | $f_{in}$=6 MHz | 76.5 | dBc |
| *Second-order harmonic distortion* | HD2 | $f_{in}$=6 MHz | 80 | dBc |
| *Third-order harmonic distortion* | HD3 | $f_{in}$=6 MHz | 90 | dBc |
| Signal to Noise plus Distorsion Ratio | SNDR | $f_{in}$=6 MHz | 71.1 | dBFS |
| Spurious Free Dynamic Range | SFDR | $f_{in}$=6 MHz | 80 | dBc |
| Inter-modulation product | | $A_{IN1}$=-8.5 dBFS, $A_{IN2}$=-8.5 dBFS | | |
| *Second-order* | IM2 | $f_{in1}$=10 MHz & $f_{in2}$=11 MHz | 79 | dBc |
| *Third-order* | IM3 | $f_{in1}$=10 MHz & $f_{in2}$=11 MHz | 79 | dBc |
| In-band Noise Spectral Density | NSD | Over 40 MHz bandwidth | -148 | dBFS/Hz |
| Worst case alias attenuation | | | 40 | dB |
| *POWER SUPPLIES & POWER CONSUMPTION* | | | | |
| Supply voltage | | | | |
| Analog | AVDD | | 1.2 | V |
| Digital | DVDD | | 1.0 | V |
| Total power consumption | $P_{ower}$ | $f_{in}$=6 MHz | 87.3 | mW |

**\* from lab measurements**

## Customization and porting

The ADX05640DST65 was evaluated and verified on silicon by our design team. It is available as a hard macro-cell. It is scalable and portable with respect to manufacturing process and can be customized as necessary for the required application.

Our proprietary design flow and qualified approach greatly increase the probability of right-first-time design. Our main concerns are your development cost and your time-to-market.

## About SCALINX

SCALINX is a fabless company designing state-of-the-art Analog and Mixed-Signal Integrated Circuits and Intellectual Property blocks for Communications and Industrial markets. Our core business is to provide tailored solutions to OEMs and semiconductor companies developing high-end systems and circuits with ultra-low power requirements and reduced Bill of Material.

Our expertise is in the field of signal conditioning, data conversion systems (ADC/DAC) and digital processing.

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SCALINX's IC design team has a cumulated expertise of more than 100 years in the semiconductor industry with a proven track record of first-time right tape-outs that led to several successful business stories.