

Preliminary Datasheet

AT1401

Features

- ❖ Dynamic Range: 125 dB
- ❖ THD+N: -112 dB
- ❖ 4 x Oversampling at 384 kHz
- ❖ 8 x Oversampling at 192 kHz
- ❖ PCM Input
- ❖ PCM formats: I²S™, Left justified
- ❖ Power supplies: ±5 V
- ❖ QFN-32 Green Package, 7mm x 7mm

Applications

- ❖ High Performance Audio
- ❖ CD and DVD Players
- ❖ Digital Audio Mixing Consoles
- ❖ Live Sound Production
- ❖ Broadcast Studio Equipment
- ❖ A/V Receivers
- ❖ Data Acquisition and Test Equipment

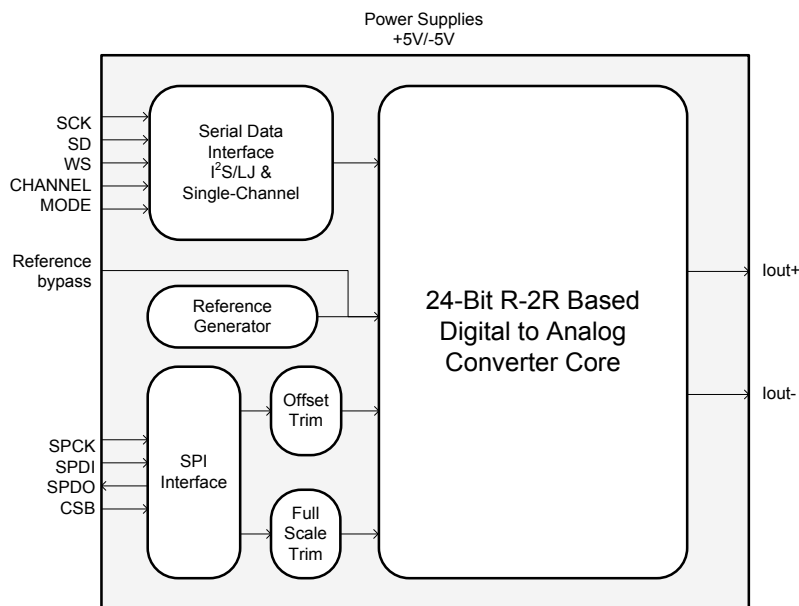


Figure 1: Block Diagram of AT1401

General Description

The AT1401 is a single channel digital-to-analog converter designed for the most uncompromising high performance audio systems. Using a precision resistor ladder architecture, the AT1401 provides industry leading THD+N of -112 dB, dynamic range of 125 dB, and an output update rate of up to 1.536 MHz supporting up to 384/352.8 kHz at 4 times oversampling. The AT1401 supports a serial input data interface using I²S, left justified (LJ), and single channel format.

Very high output impedance in the current drivers makes it possible to use off-chip resistors for current to voltage conversion. Offset and gain trimming via a SPI register interface allows for electronic calibration of mismatch in the external resistors.

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Pinout

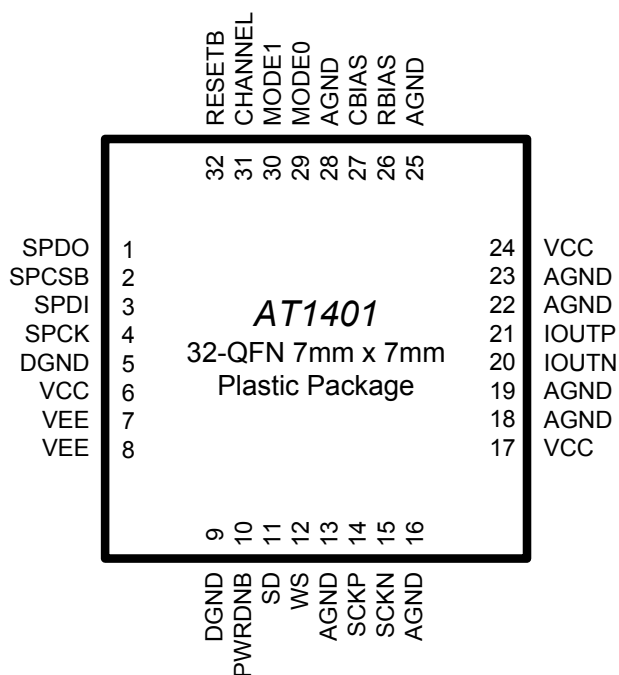


Figure 2: Pinout of the AT1401

Selected Pin Description

Terminal No.	Name	Type	Pin Description
10	PWRDNB	Digital input	Power-down
11	SD	Digital input	Serial data
12	WS	Digital input	Word select
14, 15	SCKP SCKN	Clock input	Serial audio bit clock: Differential low-swing or single-ended CMOS
20	IOUTN	Analog output	Differential negative output
21	IOUTP	Analog output	Differential positive output
26	RBIAS	Analog input	Bias resistor to set master current level (6.2 k Ω)
27	CBIAS	Analog input	Bias capacitor (10 μ F)
29, 30	MODE0/1	Digital input	Selects serial audio input modes: I ² S, LJ, SC
31	CHANNEL	Digital input	Left/right data selection for 2-channel PCM input
32	RESETB	Digital input	Reset

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Performance

Parameter	Min	Typ	Max	Notes
Full scale output current		±15.5 mA		Differential
Full scale output voltage		±310 mV		Differential into 20Ω per side
Signal-to-noise ratio AT1401 AT1401J		125 dB 123 dB		20 Hz to 20 kHz A-weighted
Dynamic range AT1401 AT1401J		125 dB 123 dB		20 Hz to 20 kHz, -60 dB input A-weighted
THD+N AT1401 AT1401J		-112 dB -106 dB		At 0 dBFS
Output common-mode voltage		-155 mV		
Output resistance		400 MΩ		
Full scale trim current		±300 μA		Corrects 4% full scale mismatch between two DACs down to ±0.1%
Analog power dissipation		210 mW		
Digital power dissipation		10 mW		

Theory of Operation

Integrated in a low-noise BiCMOS process, the AT1401 is a single channel DAC that produces a differential full scale output current of ±15.5 mA. An exceptionally high output impedance supports a differential output voltage swing of ±310 mV without any performance degradation when the DAC output pins are terminated with up to 20 Ω resistors to ground, allowing the use of a passive filter.

To compensate for mismatch in the termination resistors placed on the PC board, the AT1401 incorporates 6-bit full scale trimming and 6-bit differential offset adjustment via SPI control.

The bit clock, SCKP / SCKN, can be provided as a full rail CMOS clock driving one of the differential inputs or a low swing differential clock driving both inputs. The latter is useful when distributing the clock to multiple devices in a noisy environment.

The input data interface supports multiple formats: standard two-channel I²S and LJ as well as single channel (SC) modes. In I²S/LJ mode, a pin selects whether the single channel AT1401 runs from the left or the right channel data. In SC mode, only a single channel of data is presented to the AT1401, and the serial to parallel conversion is performed on the falling edge of the WS clock. SC mode is convenient at the highest sampling rates to keep the bit clock frequency down.