

**AD1851/AD1861**
**FEATURES**
**110 dB SNR**
**Fast Settling Permits  $16 \times$  Oversampling**
 **$\pm 3$  V Output**
**Optional Trim Allows Super-Linear Performance**
 **$\pm 5$  V Operation**
**16-Pin Plastic DIP and SOIC Packages**
**Pin-Compatible with AD1856 & AD1860 Audio DACs**
**2s Complement, Serial Input**
**APPLICATIONS**
**High-End Compact Disc Players**
**Digital Audio Amplifiers**
**DAT Recorders and Players**
**Synthesizers and Keyboards**
**PRODUCT DESCRIPTION**

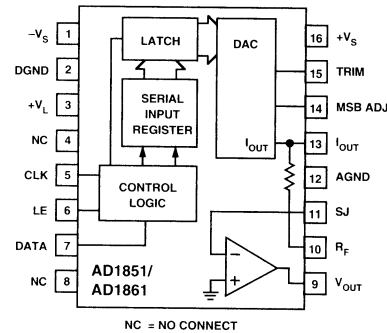
The AD1851/AD1861 is a monolithic PCM audio DAC. The AD1851 is a 16-bit device, while the AD1861 is an 18-bit device. Each device provides a voltage output amplifier, DAC, serial-to-parallel register and voltage reference. The digital portion of the AD1851/AD1861 is fabricated with CMOS logic elements that are provided by Analog Devices'  $2 \mu\text{m}$  ABCMOS process. The analog portion of the AD1851/AD1861 is fabricated with bipolar and MOS devices as well as thin-film resistors.

This combination of circuit elements, as well as careful design and layout techniques, results in high performance audio playback. Laser-trimming of the linearity error affords low total harmonic distortion. An optional linearity trim pin is provided to allow residual differential linearity error at midscale to be eliminated. This feature is particularly valuable for low distortion reproductions of low amplitude signals. Output glitch is also small, contributing to the overall high level of performance. The output amplifier achieves fast settling and high slew rates, providing a full  $\pm 3$  V signal at load currents up to 8 mA. When used in current output mode, the AD1851/AD1861 provides a  $\pm 1$  mA output signal. The output amplifier is short circuit protected and can withstand indefinite shorts to ground.

The serial input interface consists of the clock, data and latch enable pins. The serial 2s complement data word is clocked into the DAC, MSB first, by the external clock. The latch enable signal transfers the input word from the internal serial input register to the parallel DAC input register. The AD1851 input clock can support a 12.5 MHz data rate, while the AD1861 input clock can support a 13.5 MHz data rate. This serial input port is compatible with second generation digital filter chips used in consumer audio products. These filters operate at oversampling rates of  $2 \times$ ,  $4 \times$ ,  $8 \times$  and  $16 \times$  sampling frequencies.

The critical specifications of THD+N and signal-to-noise ratio are 100% tested for all devices.

The AD1851/AD1861 operates with  $\pm 5$  V power supplies, making it suitable for home use markets. The digital supply,  $V_{DD}$ , can be separated from the analog supplies,  $V_S$  and  $-V_S$ , for reduced

**FUNCTIONAL BLOCK DIAGRAM**


digital crosstalk. Separate analog and digital ground pins are also provided. Power dissipation is 100 mW typical.

The AD1851/AD1861 is available in either a 16-pin plastic DIP or a 16-pin plastic SOIC package. Both packages incorporate the industry standard pinout found on the AD1856 and AD1860 PCM audio DACs. As a result, the AD1851/AD1861 is a drop-in replacement for designs where  $\pm 5$  V supplies have been used with the AD1856/AD1860. Operation is guaranteed over the temperature range of  $-25^\circ\text{C}$  to  $+70^\circ\text{C}$  and over the voltage supply range of  $\pm 4.75$  V to  $\pm 5.25$  V.

**PRODUCT HIGHLIGHTS**

- AD1851 16-bit resolution provides 96 dB dynamic range. AD1861 18-bit resolution provides 108 dB dynamic range.
- No external components are required.
- Operates with  $\pm 5$  V supplies.
- Space saving 16-pin SOIC and plastic DIP packages.
- 100 mW power dissipation.
- High input clock data rates and  $1.5 \mu\text{s}$  settling time permits  $2 \times$ ,  $4 \times$ ,  $8 \times$  and  $16 \times$  oversampling.
- $\pm 3$  V or  $\pm 1$  mA output capability.
- THD + Noise and SNR are 100% tested.
- Pin-compatible with AD1856 & AD1860 PCM audio DACs.

**ORDERING GUIDE**

Model	Resolution	THD + N	Package Option*
AD1851N	16 Bits	0.008%	N-16
AD1851N-J	16 Bits	0.004%	N-16
AD1851R	16 Bits	0.008%	R-16
AD1851R-J	16 Bits	0.004%	R-16
AD1861N	18 Bits	0.008%	N-16
AD1861N-J	18 Bits	0.004%	N-16
AD1861R	18 Bits	0.008%	R-16
AD1861R-J	18 Bits	0.004%	R-16

\*N = Plastic DIP Package; R = Small Outline (SOIC) Package. For outline information see Package Information section.

To obtain the most recent version or complete data sheet, call our fax retrieval system at 1-800-446-6212 or visit our World Wide Web site at <http://www.analog.com>.

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