LEADING inside

A series of engineering insights
by Analog Devices.

Boost Precision and Accuracy with Single Chip Capacitance- and Impedance-to-Digital Converters

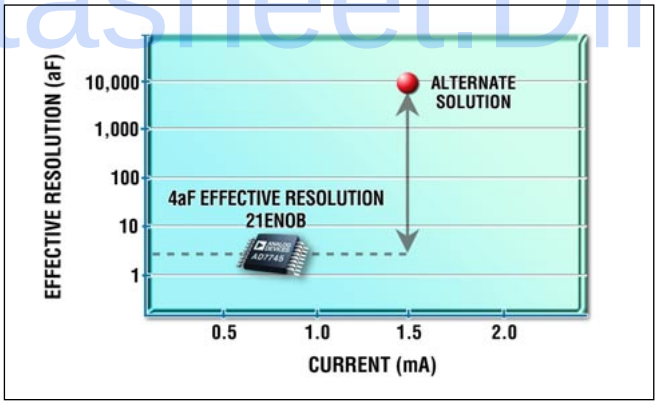
High precision capacitance- and impedance-sensing applications traditionally required a complex collection of discrete components that needed to be skillfully combined together to provide an overall measurement solution. Not only was this time consuming from a component selection perspective but as each application differed slightly, it also required significant design validation, evaluation, optimization, and qualification.

Overcoming Design Barriers with New Converter Architectures

By architecting an optimized solution that incorporates all of the required functionality on a single chip, Analog Devices has created two new converters that provide system level solutions for impedance and capacitance conversion and deliver higher precision and accuracy while reducing size, design time, cost, and power. This advanced level of integration is particularly important when processing small signals where excess noise, component tolerances, and temperature drift can adversely impact measurement accuracy. In addition to providing superior performance, both converters are available in small packages. Applications in the industrial instrumentation, automotive, and biomedical sectors can benefit from higher precision capacitance measurement or simplified impedance analysis—both at lower cost and without the inherent complexities and design limitations of multichip discrete designs.

Convert Capacitive Sensor Signals to Digital with High Precision

The architecture of the AD7745/AD7746/AD7747 capacitance-to-digital converters (CDC), which includes a patented analog front end interface, eliminates the negative effects of external parasitic capacitance. This architecture opens up high performance applications in medical instrumentation (for patient monitoring and blood pressure measurements), in industrial instrumentation (for pressure and level sensors and smart transmitters), and in automotive environments (for position and level sensing, as well as occupancy and proximity detection).

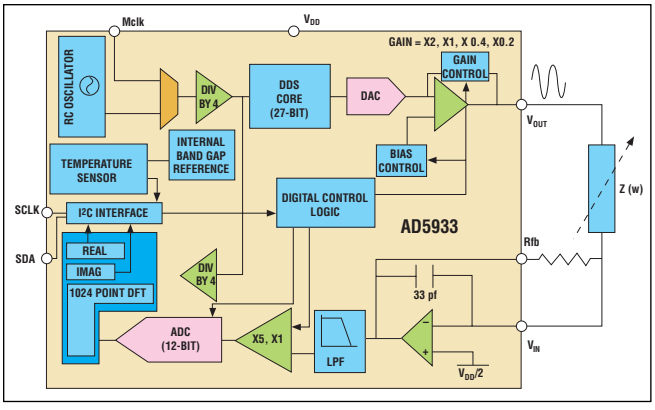


The AD7745 delivers high precision with unequaled accuracy, low noise, and low power.

The CDC is suitable for these applications because of its unique combination of high precision, small package, low power, low cost, low temperature drift, and low noise. The AD7745/AD7746/AD7747 are available in small 16-lead TSSOP packages at 1k unit pricing of $4.60 (AD7745/AD7747) and $4.95 (AD7746).

Measure Impedance More Accurately with Mixed-Signal Integration

The new AD5933/AD5934 impedance-to-digital converters (IDC) put direct digital synthesis (DDS), analog-to-digital conversion, and DSP on a single chip. The IDC measures impedances ranging from 100 Ω to 10 MΩ, excited with an on-chip frequency generator of up to 100 kHz. The response signal from the impedance is sampled by the on-chip ADC and its discrete Fourier transform (DFT) is processed by an on-chip DSP. The DFT algorithm returns both a real (R) and imaginary (I) data word at each frequency point (for a sweep), enabling phase and amplitude impedance calculations based on an initial calibration. The AD5933/AD5934 are available in small 16-lead SSOP packages at 1k unit pricing of $4.35 (AD5934) and $6.65 (AD5933). For additional product information, go to *www.analog.com/CDC* and *www.analog.com/IDC*.



The AD5933 block diagram illustrates the advanced level of integration contained in its single-chip form factor.

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