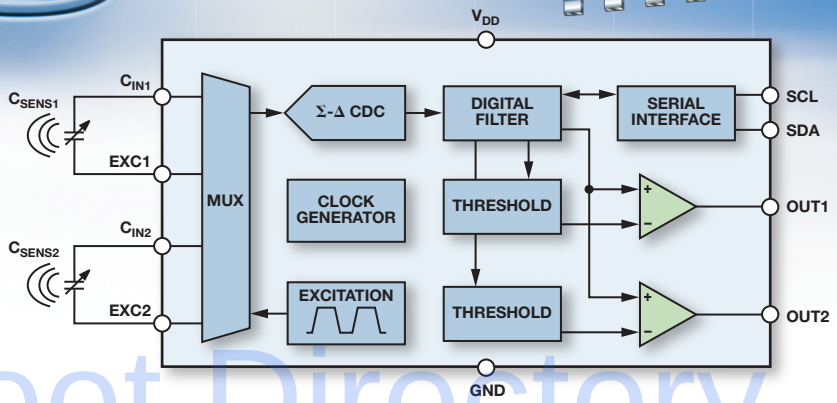
AD7150 Capacitance Converter for Proximity Sensing



Features

- Ultralow power: 3.3 V, 100 μA
- Response time: 10 ms
- Adaptive environmental compensation
- 2 independent capacitance input channels
  - Sensor capacitance (C_{SENS}): 0 pF up to 13 pF
  - Sensitivity to 1 fF
- EMC tested
- AEC-Q100 qualified
- 2 modes of operation:
  - Standalone with fixed settings
  - Interfaced to a μC for user-defined settings
- 2 proximity detection output flags
- 2-wire serial interface (I^2C-compatible)
- Operating temperature: −40°C to +85°C
- 10-lead MSOP package

Applications

- Smart entry systems
- Remote detection
- Contactless switches
- Level switches

Addresses Power and Sensitivity Requirements

Problem

Discrete sensors have a history of being expensive and difficult to implement. These constraints often prevent designers from adding sensing functions to their system designs due to cost and excessive power consumption.

Solution

Leveraging ADI's established capacitance technology, the new AD7150 for sensor systems delivers a complete signal processing solution for proximity sensors. This new device offers important features such as electromagnetic compatibility, adaptive environmental calibration, small package, low power consumption, and fast response time. Unlike existing solutions that use potentially unreliable and power hungry optical sensors, the AD7150 consumes just 100 μA, resulting in a 70% power savings.

The AD7150 has undergone extensive EMC evaluation, making it particularly suitable for use in the harsh environments of today's demanding automotive applications. In addition, ADI's patented front-end architecture makes the AD7150 tolerant of input parasitic ground capacitance, leakage currents, and power supply noise. This capability greatly enhances the implementation of robust and highly sensitive proximity sensor systems that provide consistent detection every time.

The proximity sensor system is further enhanced by the on-chip adaptive environmental calibration feature. This feature enables the device to automatically recalibrate and adapt to capacitance changes due to shifts in environmental conditions, such as temperature, humidity, and the gradual buildup of dust and dirt.

The AD7150 is specified over the −40°C to +85°C temperature range and communicates over an I^2C®-compatible 2-wire serial interface. The AD7150 is available in 10-lead MSOP, priced at $1.35 in 1000 unit quantities. Automotive models are available.

High Precision Capacitance-to-Digital Converters (CDCs)

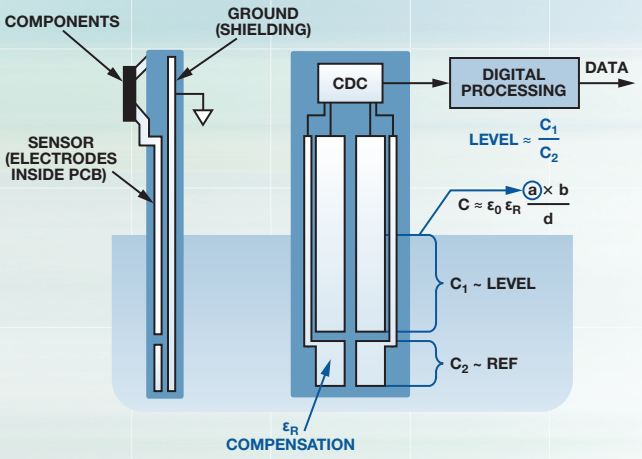
Analog Devices offers a range of integrated capacitive sensing solutions suitable for industrial, instrumentation, medical, and automotive applications.

Application Focus: Level Sensing

Capacitance level sensors are finding more popularity in a wide range of applications due to their ability to not only measure fluid level, but to also measure changes in the fluid consistency by detecting changes in the relative permittivity. The AD7746 is a 24-bit measurement solution that provides continuous high precision level measurement over the entire sensor range. The AD7152 is a 12-bit measurement solution similar to the AD7746. It is suitable for applications where precision can be traded against cost. The AD7150 can be used as a level switch, providing an on/off threshold, and is the most cost-effective solution for level sensing.

Applications

- Proximity sensing
- Dew point sensing
- Pressure measurement
- Level measurement/switch
- Position sensing
- Touch sensing
- Humidity sensing
- Rain sensing
- Impurity detection
- Flow sensing



Precision CDCs

Part Number	Resolution (Bits)	Throughput Rate (SPS)	Number of Channels	Supply Voltage (V)	Maximum Power Dissipation (mW)	Input Base Capacitance Max (pF)	C_{IN} Range (pF)	Package	Price @ 1k ($U.S.)
AD7150	12	100	2	2.7 to 3.6 (single)	0.43	10	4	10-lead MSOP	1.35
AD7151	12	100	1	2.7 to 3.6 (single)	0.3	10	4	10-lead MSOP	1.35
AD7152	12	200	2	2.7 to 3.6 (single)	0.43	10	±2	10-lead MSOP	1.95
AD7153	12	200	1	2.7 to 3.6 (single)	0.43	10	±2	10-lead MSOP	1.75
AD7745	24	90	1	2.7 to 5.25 (single)	4.25	17	±4	16-lead TSSOP	4.60
AD7746	24	90	2	2.7 to 5.25 (single)	4.25	17	±4	16-lead TSSOP	4.95
AD7747	24	45.5	1	2.7 to 5.25 (single)	4.25	17	±8	16-lead TSSOP	4.60

Analog Devices, Inc. Worldwide Headquarters
Analog Devices, Inc.
One Technology Way
P.O. Box 9106
Norwood, MA 02062-9106
U.S.A.
Tel: 781.329.4700
(800.262.5643,
U.S.A. only)
Fax: 781.461.3113

Analog Devices, Inc. Europe Headquarters
Analog Devices, Inc.
Wilhelm-Wagenfeld-Str. 6
80807 Munich
Germany
Tel: 49.89.76903.0
Fax: 49.89.76903.157

Analog Devices, Inc. Japan Headquarters
Analog Devices, KK
New Pier Takeshiba
South Tower Building
1-16-1 Kaigan, Minato-ku,
Tokyo, 105-6891
Japan
Tel: 813.5402.8200
Fax: 813.5402.1064

Analog Devices, Inc. Southeast Asia Headquarters
Analog Devices
22/F One Corporate Avenue
222 Hu Bin Road
Shanghai, 200021
China
Tel: 86.21.2320.8000
Fax: 86.21.2320.8222

Printed in the U.S.A. PH07504-2-6/08(A)

www.analog.com/cdc