A Revolution in Sensing

World's First Inductance-to-Digital Converter

Texas Instruments

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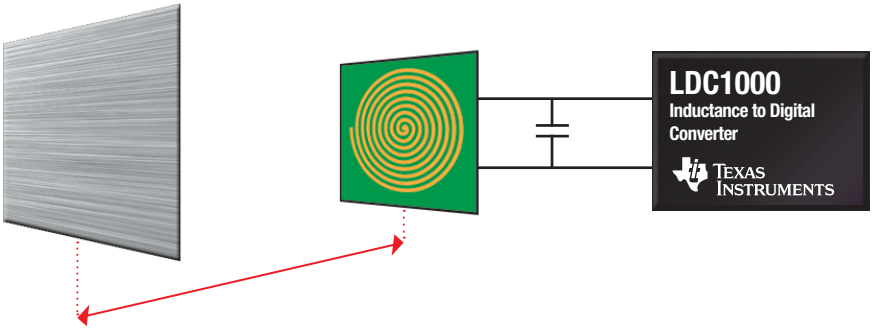
2013

LDC1000 Inductance-to-Digital Converter



LDC1000 Key Specifications

- Oscillation frequency: 5 kHz to 5 MHz
- Oscillation amplitude: 1,2,4 V_{PP}
- Eddy current losses (R_P) measurement
  - Range: 798 Ω to 3.93 MΩ
  - R_P resolution: 16-bit
- Inductance (L) measurement
  - L resolution: 24-bit
- Maximum output data rate: 78 kHz
- Supply current: 1.7 mA
- Package: SON-16
- Interface: SPI

Applications

Inductive sensing technology is changing the way customers build their systems in many markets including:

- Automotive
- Industrial
- Consumer
- Medical
- Computing
- Mobile devices
- White goods
- Communications

Inductive Sensing Technology

A Revolution in Sensing

Inductive sensing is a new, contactless, magnet-free technology that revolutionizes sensing by delivering better performance, better reliability, and greater flexibility than existing solutions, at a lower system cost. The LDC1000 is the world's first inductance-to-digital converter that enables inductive sensing.

Better Performance and Reliability

The LDC1000 provides 16-bit resonance impedance and 24-bit inductance values, enabling sub-micron resolution in position-sensing applications. Inductive sensing is also immune to non-conductive interferences such as dirt and dust and it supports remote sensor placement, making it well-suited for extreme and harsh environments.

Lower System Cost

The sensor is virtually free because the sensor can be a wound wire, a coil on a PCB, a coil printed with conductive ink on a flexible substrate, or even a simple spring. You also avoid the high costs of magnets, especially those requiring rare-earth materials.

Limitless Design Possibilities

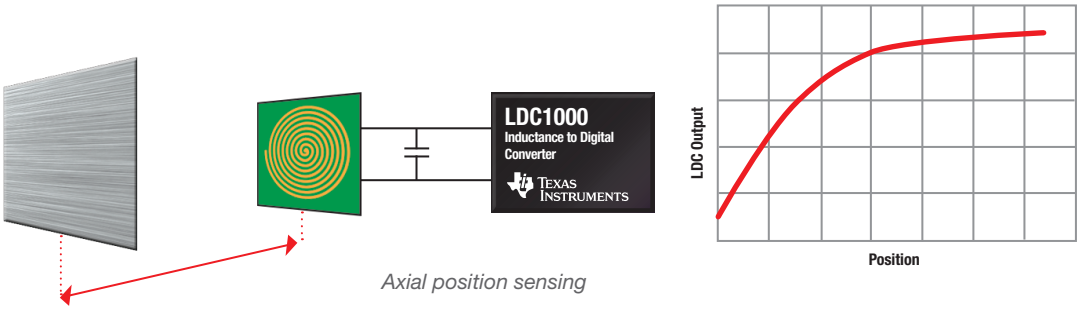
Low-cost implementations of conductive targets via pressed foil or conductive ink offer endless opportunities for creative and innovative system design, even in the presence of other metals or conductors.

Advantages of Inductive Sensing

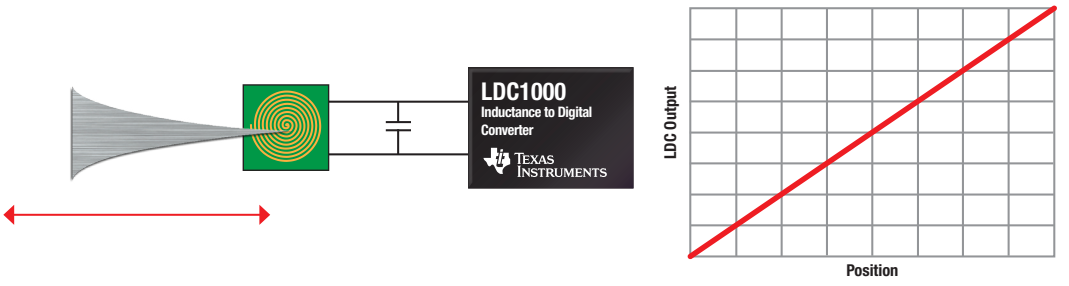
- Lower system costs
- Remote sensor location
- Higher reliability
- Greater system design flexibility
- Magnet-free operation
- Sub-micron resolution
- Contactless sensing
- Immunity to non-conductive interferences
- Limitless design possibilities

Modes of Operation

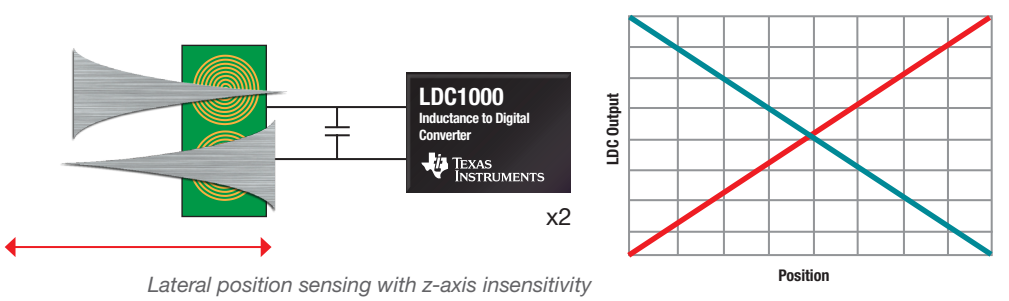
Inductive sensing can be used to measure the position, motion, or composition of a metal or conductive target, as well as detect the compression, extension, or twist of a spring.



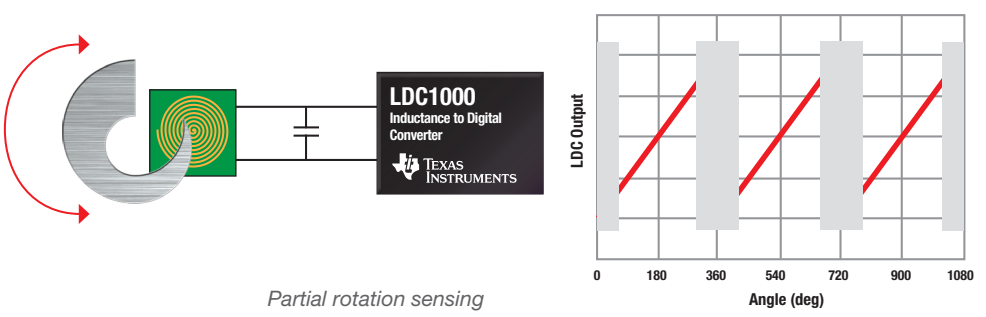
Axial position sensing



Lateral position sensing

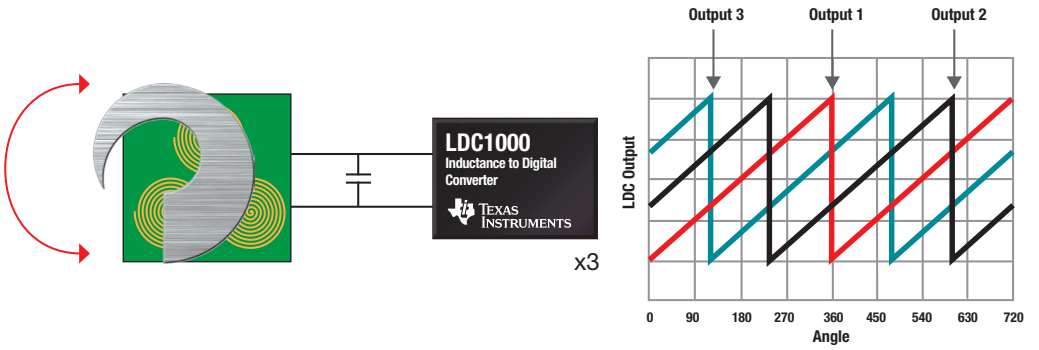


Lateral position sensing with z-axis insensitivity

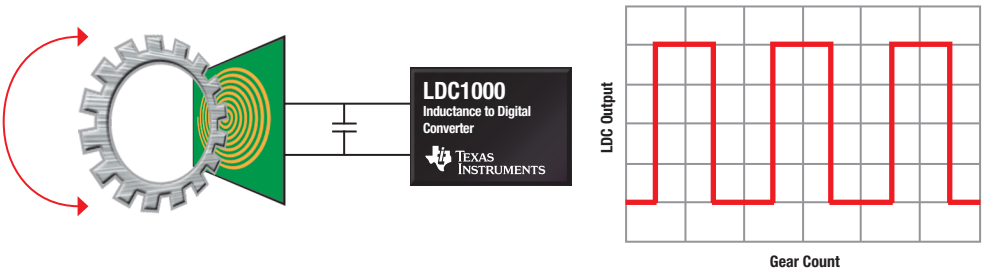


Partial rotation sensing

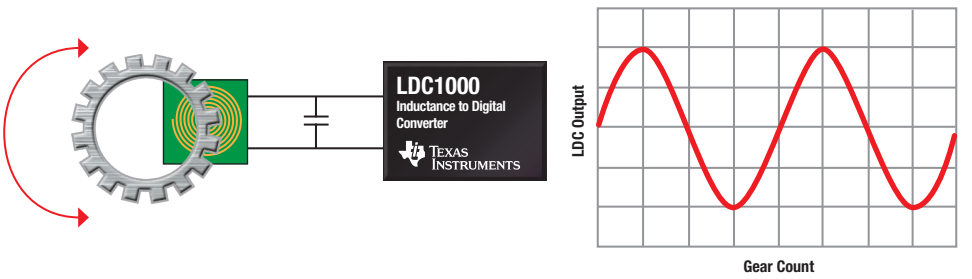
Modes of Operation



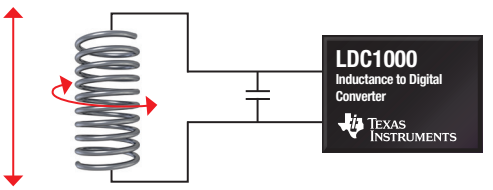
Full rotation sensing with z-axis insensitivity



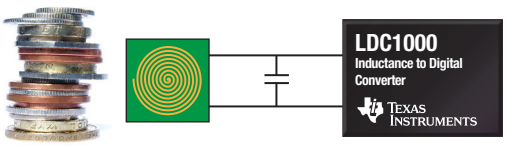
Gear-tooth counting – perpendicular to coil



Gear-tooth motion – parallel to coil



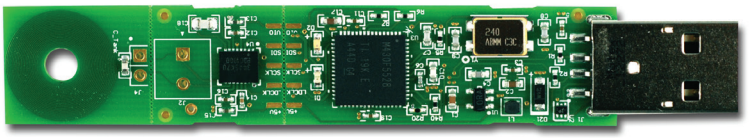
Compression, extension, and twist using a spring as a sensor



Metal composition identification

Design Resources and References

LDC1000 Evaluation Module (EVM)



EVM Key Features

- EVM and GUI provide complete prototyping and evaluation platform
- USB interface allows control and evaluation of LDC1000 with GUI
- Includes 14 mm 2-layer PCB coil sensor
- Included coil can be removed to allow prototyping with other coils, springs, or inductors
- Coil and LDC1000 board section can be removed to interface with other MCUs or allow multi-channel prototyping

TI E2E™ Community

E2E Inductive Sensing Forum
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To learn more about TI's inductive sensing technology, visit **ti.com/ldc**:

- Product samples
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