

LDC1000EVM

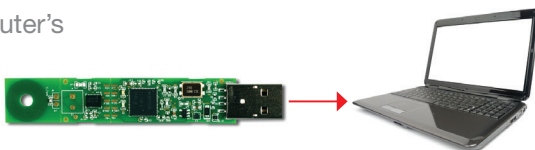
EVM Quick Start Guide



Getting started with the LDC1000EVM

1. Download and install the EVM software from ti.com/ldc

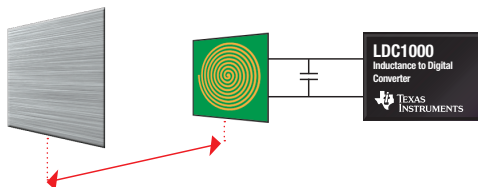
2. Plug in EVM to computer's USB port



3. Make sure GUI indicates EVM connection



4. Move conductive target near to/far from coil



5. Observe GUI for changes in LDC response

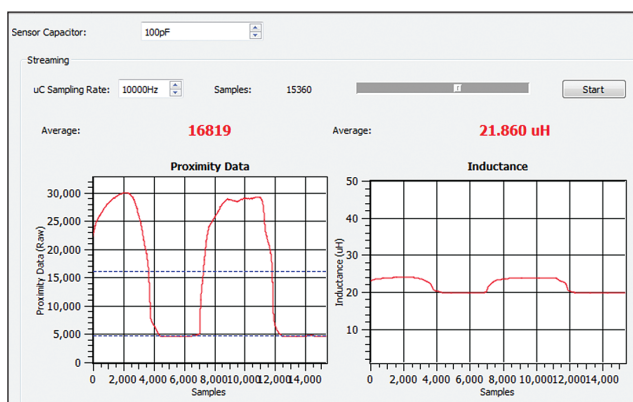


Fig.1 Example data capture

Inductive
Sensing

Interfacing Different Sensor Coils

Getting a custom sensor to operate with LDC1000

1. Break off EVM coil along perforation

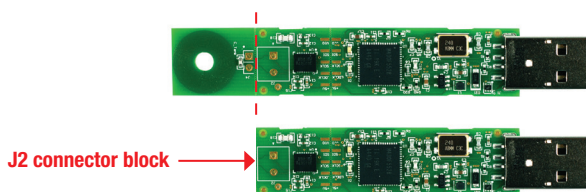


Fig.2 Custom coil connection

2. Connect custom sensor coil and capacitor (C) to J2 on the EVM (Fig. 2)

Steps to pick C:

- Calculate / measure inductance of the coil (L)
- Calculate / measure resistance of the coil (R_s)
- Pick C value to satisfy **both** conditions below:

- Resonance frequency between 5 kHz to 5 MHz:
$$f_{\text{RES}} = \frac{1}{2 \cdot \pi \cdot \sqrt{LC}}$$

- Resonance impedance (R_p) between 798 Ω to 3.93 M Ω :
$$R_p = \frac{1}{R_s} \cdot \frac{L}{C}$$

Note: If L is not large enough, add discrete inductor in series with sensor

3. Plug EVM into host and ensure GUI indicates EVM connection

4. GUI settings

Note: On the streaming screen (Fig. 1), make sure to STOP data capture when making changes to register settings and START data capture to apply the changes

- Update **Sensor Capacitor** value on GUI configuration page to the chosen value of C
- Program **Sensor Frequency** register: value should be 20% below sensor's resonant frequency
- Program **LDC Configuration** register:
 - Amplitude: 4V
 - Response time: 6144 cycles
- Determine **Rp_MAX** and **Rp_MIN** register values:
 - Set **Rp_MIN** to minimum value = 0.798 k Ω
 - Set **Rp_MAX** to maximum value = 3926.991 k Ω
 - START data capture. Check "Proximity Data" value.

Note: If "Proximity Data" equals 0, add a discrete inductor in series to the sensor coil to get into the operating range of the LDC

(continued)

- Keep target at desired minimum sensing distance. Reconfigure Rp_MIN to a higher value such that “Proximity Data” is close to 32768 (2¹⁵)
- Keep target at desired maximum sensing distance. Reduce Rp_MAX sequentially until “Proximity Data” becomes 0. Set final value of Rp_MAX to last working value with “Proximity Data” greater than 0.

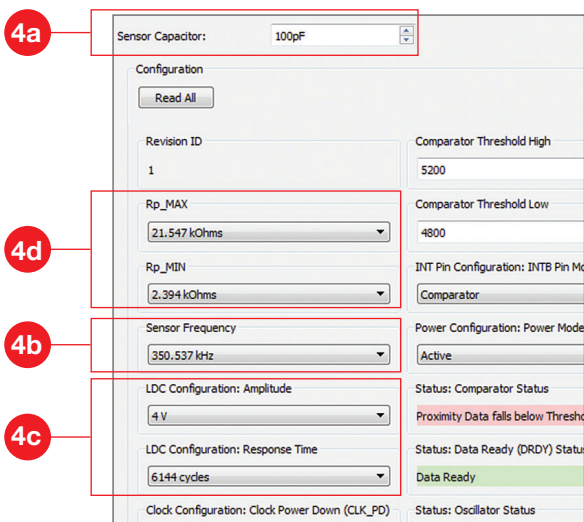


Fig. 3 Example setting

5. Verify waveform on CFB pin as in image

Note: Make sure to set time base of the oscilloscope to 1/5 of the oscillation period, to observe appropriate amplitude

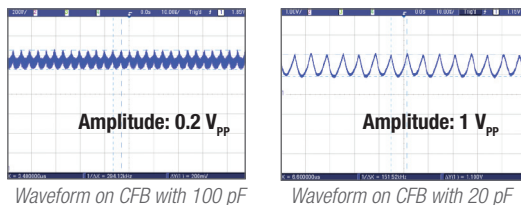


Fig. 4 Expected waveforms

6. Press START to begin data capture

7. Move conductive target near to/far from coil, and observe LDC response (as in Fig. 1)

- If using a spring as sensor – compress, expand and twist to see changes in response

To maximize the performance of your custom sensor, follow the additional instructions in the LDC1000 datasheet to optimize your R_p settings.

Design Resources and References

Available on ti.com/ldc

- LDC1000 datasheet
- Complete LDC1000 user guide
- LDC1000 application note
- EVM software download
- WEBENCH® Inductive Sensing Coil Designer

E2E Inductive Sensing Forum

ti.com/e2eldc



Important Notice: The products and services of Texas Instruments Incorporated and its subsidiaries described herein are sold subject to TI's standard terms and conditions of sale. Customers are advised to obtain the most current and complete information about TI products and services before placing orders. TI assumes no liability for applications assistance, customer's applications or product designs, software performance, or infringement of patents. The publication of information regarding any other company's products or services does not constitute TI's approval, warranty, or endorsement thereof.

The platform bar, E2E, and WEBENCH are trademarks of Texas Instruments.
All other trademarks are the property of their respective owners.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
OMAP Applications Processors	www.ti.com/omap
Wireless Connectivity	www.ti.com/wirelessconnectivity

Applications

Automotive and Transportation	www.ti.com/automotive
Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Video and Imaging	www.ti.com/video

TI E2E Community

e2e.ti.com