LDC1000EVM

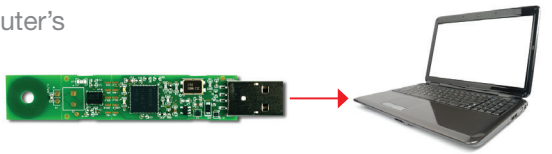
EVM Quick Start Guide

Texas Instruments

Getting started with the LDC1000EVM

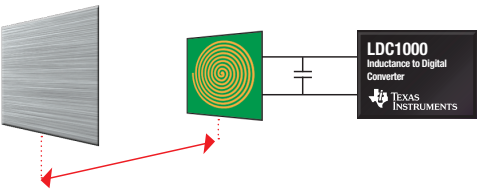
1. Download and install the EVM software from ti.com/ldc

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

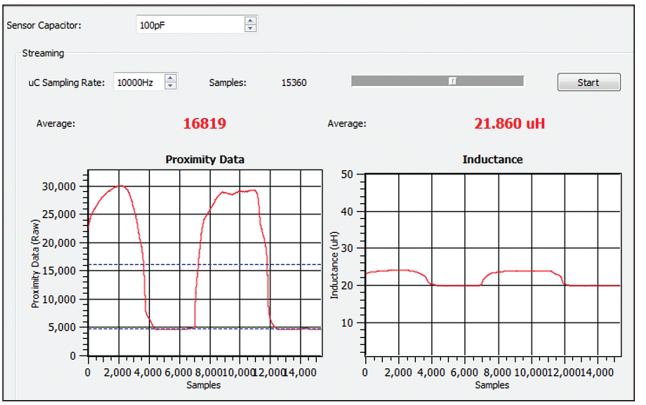


Fig.1 Example data capture

Inductive Sensing

Interfacing Different Sensor Coils

Getting a custom sensor to operate with LDC1000

1. Break off EVM coil along perforation

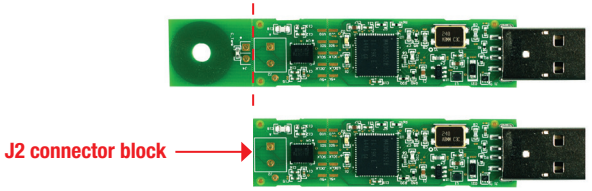


Fig.2 Custom coil connection

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

   Steps to pick C:

   a. Calculate / measure inductance of the coil (L)

   b. Calculate / measure resistance of the coil (R_S)

   c. Pick C value to satisfy **both** conditions below:

   - Resonance frequency between 5 kHz to 5 MHz: $f_{RES} = \frac{1}{2*pi*\sqrt{LC}}$
   - Resonance impedance (R_P) between 798 Ω to 3.93 MΩ: $R_P = \frac{1}{R_S} * \frac{L}{C}$

   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*

   4a Update **Sensor Capacitor** value on GUI configuration page to the chosen value of C

   4b Program **Sensor Frequency** register: value should be 20% below sensor's resonant frequency

   4c Program **LDC Configuration** register:
   - Amplitude: 4V
   - Response time: 6144 cycles

   4d Determine **Rp_MAX** and **Rp_MIN** register values:
   - Set Rp_MIN to minimum value = 0.798 kΩ
   - Set Rp_MAX to maximum value = 3926.991 kΩ
   - 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 (2^{15})
- 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.

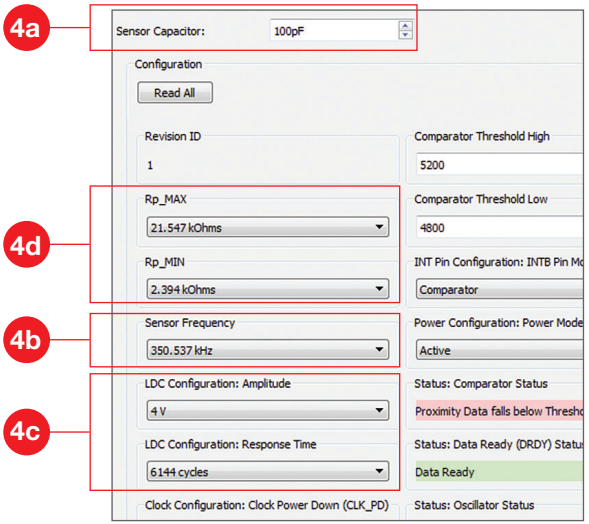
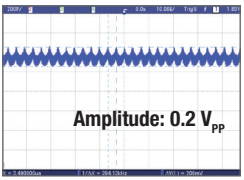


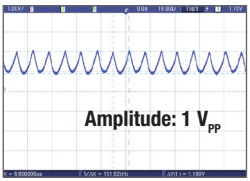
Fig. 3 Example setting

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



Waveform on CFB with 100 pF



Waveform on CFB with 20 pF

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
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TI E2E™ Community

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