LX34311
Inductive Position Sensor Evaluation Board/Kit User Guide

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LX34311 INDUCTIVE POSITION SENSOR EVALUATION BOARD/KIT USER GUIDE

Table of Contents

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Preface

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Documents are identified with a "DS" number. This number is located on the bottom of each page, in front of the page number. The numbering convention for the DS number is "DSXXXXXXXXA", where "XXXXXXXX" is the document number and "A" is the revision level of the document.

For the most up-to-date information on development tools, see the MPLAB® IDE online help. Open the Help menu and select "Topics" to access a list of available online help files.

INTRODUCTION

This chapter contains general information that will be useful to know before using the LX34311 Inductive Position Sensor Evaluation Board/Kit. Items discussed in this chapter include:

- Document Layout
- Conventions Used in this Guide
- Recommended Reading
- The Microchip Website
- Customer Support
- Document Revision History

DOCUMENT LAYOUT

This document describes how to use the LX34311 Inductive Position Sensor Evaluation Board/Kit to emulate and debug firmware on a target board. The manual layout is as follows:

- **Chapter 1. "Product Overview"** – This chapter describes the most important features of the LX34311 Inductive Position Sensor Evaluation Board/Kit as well as the contents of the kit and a step-by-step Quick Start Guide.
- **Chapter 2. "Installation and Operation"** – This chapter provides technical details important for the operation of the LX34311 Inductive Position Sensor Evaluation Board/Kit.
- **Appendix A. "Schematic and Layouts"** – Shows the schematic and layout diagrams for the LX34311 Inductive Position Sensor Evaluation Board/Kit.
- **Appendix B. "Bill of Materials (BOM)"** – Lists the parts used to build the LX34311 Inductive Position Sensor Evaluation Board/Kit.

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CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

Description	Represents	Examples
Arial font:		
Italic characters	Referenced books	*MPLAB® IDE User's Guide*
	Emphasized text	...is the *only* compiler...
Initial caps	A window	the Output window
	A dialog	the Settings dialog
	A menu selection	select Enable Programmer
Quotes	A field name in a window or dialog	"Save project before build"
Underlined, Italic text with right angle bracket	A menu path	*File>Save*
Bold characters	A dialog button	Click **OK**
	A tab	Click the **Power** tab
N'Rnnnn	A number in verilog format, where N is the total number of digits, R is the radix and n is a digit.	4'b0010, 2'hF1
Text in angle brackets < >	A key on the keyboard	Press <Enter>, <F1>
Courier New font:		
Plain Courier New	Sample source code	`#define START`
	File names	`autoexec.bat`
	File paths	`c:\mcc18\h`
	Keywords	`_asm, _endasm, static`
	Command-line options	`-Opa+, -Opa-`
	Bit values	`0, 1`
	Constants	`0xFF, 'A'`
Italic Courier New	A variable argument	*`file`*`.o`, where *`file`* can be any valid filename
Square brackets [ ]	Optional arguments	`mcc18 [options]` *`file`* `[options]`
Curly brackets and pipe character: { | }	Choice of mutually exclusive arguments; an OR selection	`errorlevel {0|1}`
Ellipses...	Replaces repeated text	`var_name [, var_name...]`
	Represents code supplied by user	`void main (void) { ... }`

RECOMMENDED READING

This user guide describes how to use the LX34311 Inductive Position Sensor Evaluation Board/Kit.

THE MICROCHIP WEBSITE

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- **Product Support** – Data sheets and errata, application notes and sample programs, design resources, user guides and hardware support documents, latest software releases and archived software
- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups and a Microchip design partner program member listing
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- Local Sales Office
- Embedded System Engineer (ESE)
- Technical Support

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DOCUMENT REVISION HISTORY

Revision A (May 2025)

- Initial release of this document.

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Chapter 1. Product Overview

1.1 INTRODUCTION

This chapter provides an overview of the LX34311 Inductive Position Sensor Evaluation Board/Kit, as well as a Quick Start Guide.

Start the next sensor development with a LX34311 Inductive Position Sensor Evaluation Board/Kit for higher accuracy, immunity to motor noise, and no need for a magnetic target. The sensor system consists of the inductive position sensor IC (LX34311), its printed circuit board (PCB) sensor and the target. A target metal is attached to the moving mechanical housing, which provides a position relative to the fixed position of the sensor PCB.

The LX34311 Inductive Position Sensor Evaluation Board/Kit, along with the free Integrated Programming and Calibration Environment (IPCE) software, allows the user to evaluate, auto-calibrate and customize the sensors to their application needs.

The LX34311 Inductive Position Sensor Evaluation Board/Kit User Guide is applicable for the following two boards:

- LX34311 120 Degree Rotary EVB (EV89F24A)
- LX34311 120 Degree Rotary EVK (EV02D18A)

1.2 FEATURES

The LX34311 Inductive Position Sensor Evaluation Board/Kit has the following features:

- Miniature sensor design with good output accuracy
- Fully IPCE compatible (programming, calibration and auto-detection in IPCE)

1.3 LX34311 INDUCTIVE POSITION SENSOR EVALUATION BOARD/KIT CONTENTS

The Evaluation Kit contains the following items:

1. Inductive position sensor PCB with target assembly
2. Interfacing cable for the LXM9518 programmer
3. LXM9518 with USB cable to connect to PC (kit only)
4. The IPCE software can be downloaded from www.microchip.com.

Figure 1-1 shows a picture of the LX34311 120 Degree Rotary EVB (EV89F24A) and Figure 1-2 shows a picture of the LX34311 120 Degree Rotary Kit (EV02D18A).

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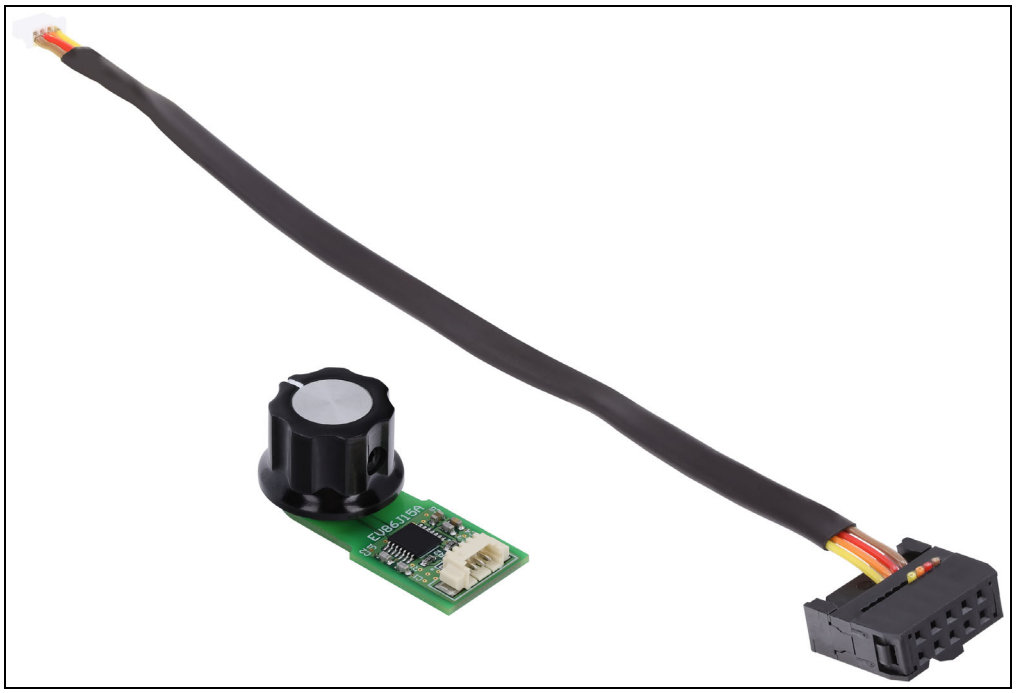

FIGURE 1-1: *LX34311 120 Degree Rotary EVB (EV89F24A).*

FIGURE 1-2: *LX34311 120 Degree Rotary Kit (EV02D18A).*

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1.4 QUICK START GUIDE

The LX34311 Inductive Position Sensor Evaluation Board/Kit includes an Integrated Programming and Calibration Environment (IPCE) to facilitate system calibration and configuration. The integrated programming environment contains an EEPROM programming tool and data measuring system.

Follow these steps to install and start operating the LX34311 Inductive Position Sensor Evaluation Board/Kit:

1. To download the IPCE software, access the Sensor Evaluation and Calibration Software (2.x) from the LX34311 product page.
2. Install the program.
3. Connect the LXM9518 programmer USB cable to the PC and connect the other end to the sensor board using the supplied cable.
4. Open the installed IPCE program and follow the instructions showed on IPCE to update the firmware for the LXM9518 programmer.
5. As the inductive sensor IC is preloaded with golden parameters and the programmer is updated with the respective firmware, the IPCE will automatically detect the sensor and start displaying the live data of the sensor in the IPCE.
6. At this point, the sensor can be customized to the customer's needs. See the videos available on the web on how to use the IPCE to optimize the system performance.

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Chapter 2. Installation and Operation

This chapter explains the key technical aspects of the LX34311 Inductive Position Sensor Evaluation Board/Kit. It begins with a brief discussion of the system operation of the LX34311 Inductive Position Sensor Evaluation Board/Kit, features a picture of the board and connector pinout instructions and concludes with an example diagram of linearity.

2.1 SYSTEM OPERATION

The LX34311 Inductive Position Sensor Evaluation Board/Kit has been factory calibrated and is ready to use.

The EVB consists of a main sensor board and a movable target PCB. The main sensor board contains two oscillator coils (OSC1 and OSC2) and two pickup coils (CL1 and CL2). The IC energizes the two oscillator coils. The position of the target varies the reception of the two pickup coils relative to each other. The IC demodulates the two received signals and generates an output signal (A_{OUT} and D_{OUT}) representative of the relative difference between the CL1 and CL2 signals (see Figure 2-1).

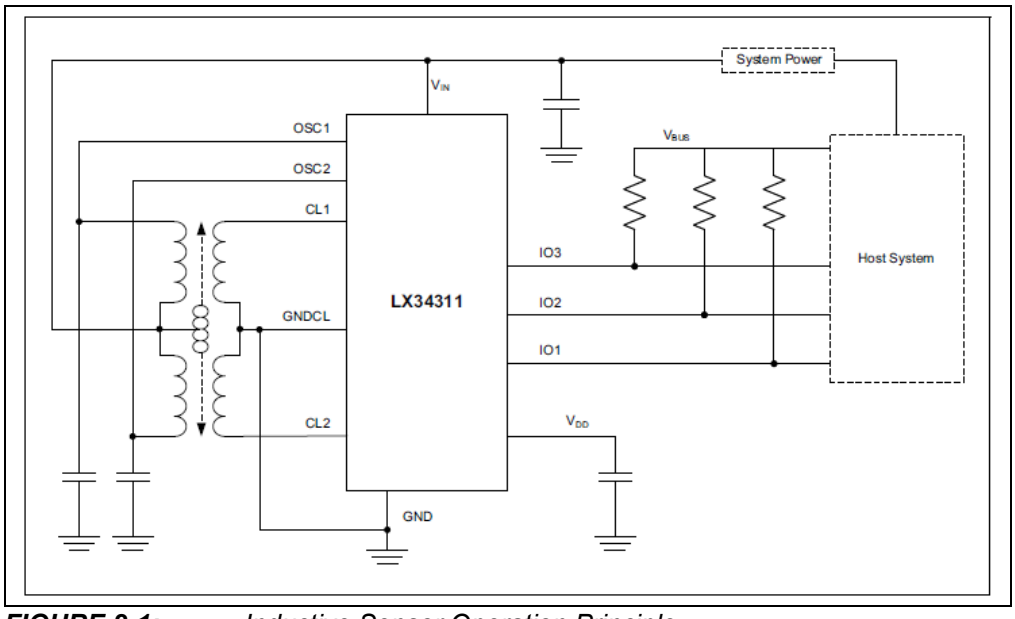

FIGURE 2-1: *Inductive Sensor Operation Principle.*

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2.2 DETAILS OF CONNECTORS ON SENSOR BOARD

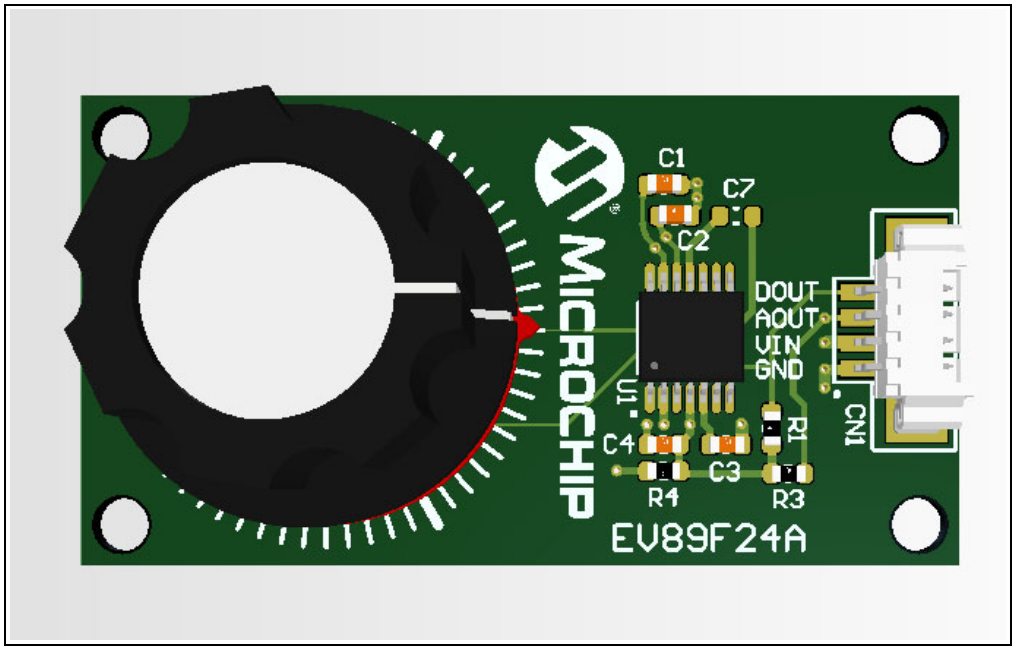

FIGURE 2-2: *LX34311 120 Degree Rotary EVB (EV89F24A).*

The sensor assembly comes with a 4-pin (CN1) to 10-pin connector for programming, using the LXM9518 programmer (Table 2-1 and Table 2-2 show the pinout of this connector).

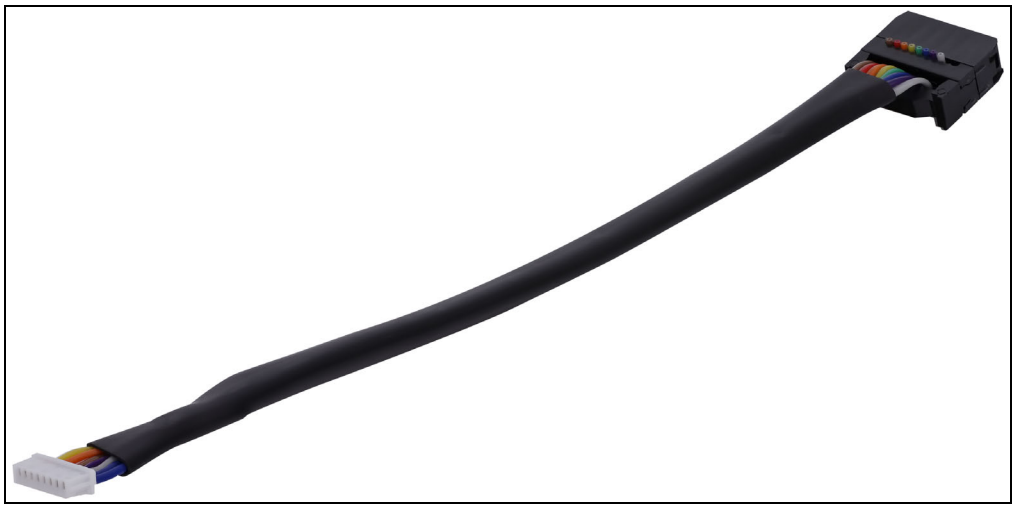

FIGURE 2-3: *4-pin (CN1) to 10-pin (CN2) Connector.*

TABLE 2-1: CN1 CONNECTOR PINOUT

Pin#	Pin Name	Functional Description
1	GND	Ground
2	V_{IN}	+5V Supply/Internal EEPROM programming
3	A_{OUT}	AOUT output can be programmed to Analog/PWM/TD
4	D_{OUT}	DOUT output can be programmed to PWM/TD

TABLE 2-2: CN2 CONNECTOR PINOUT

Pin#	Pin Name	Functional Description
1	D_{OUT}	D_{OUT} output is the PWM/TD
2	A_{OUT}	A_{OUT} output is the Analog/PWM/TD
3	V_{IN}	+5V Supply/Internal EEPROM programming
4	GND	Ground
5	SDA	I^2C serial data (internal purpose only, not for external use) Reserved
6	SCL	I^2C serial clock (internal purpose only, not for external use) Reserved
7	IO1 (ICSPCLK)	Only used for digital programming mode (clock for programming internal microcontroller)
8	IO4 (ICSPDAT)	Only used for digital programming mode (data line for programming internal microcontroller)
9	MCLR	Master Clear (used for programming internal microcontroller)
10	V_{DD}	Internal device supply

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2.3 INDUCTIVE SENSOR BOARD TYPICAL CHARACTERISTICS

The plot in Figure 2-4 displays an example of linearity achievable with the inductive sensor with an analog output. Other output formats will have the same accuracy. The error plot is the zoomed difference between the ideal slope and the analog output.

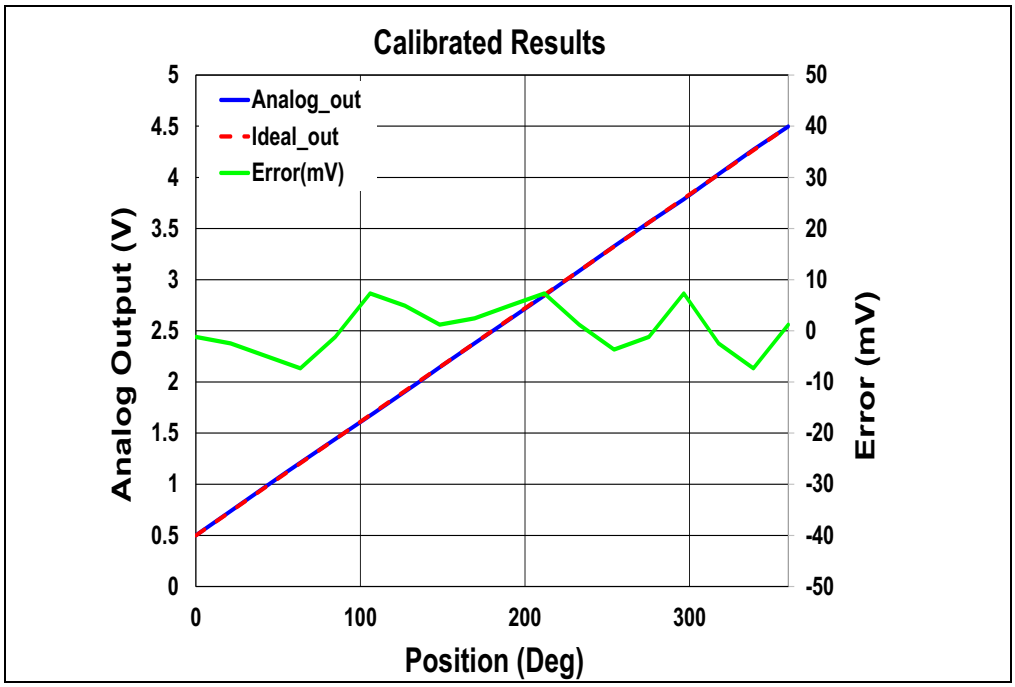

FIGURE 2-4: *Typical Inductive Sensor Board Linearity.*

Appendix A. Schematic and Layouts

A.1 INTRODUCTION

This appendix contains the following schematics and layouts for the LX34311 Inductive Position Sensor Evaluation Board/Kit:

- Board – Schematic
- Board – Top Assembly
- Board – Bottom Assembly

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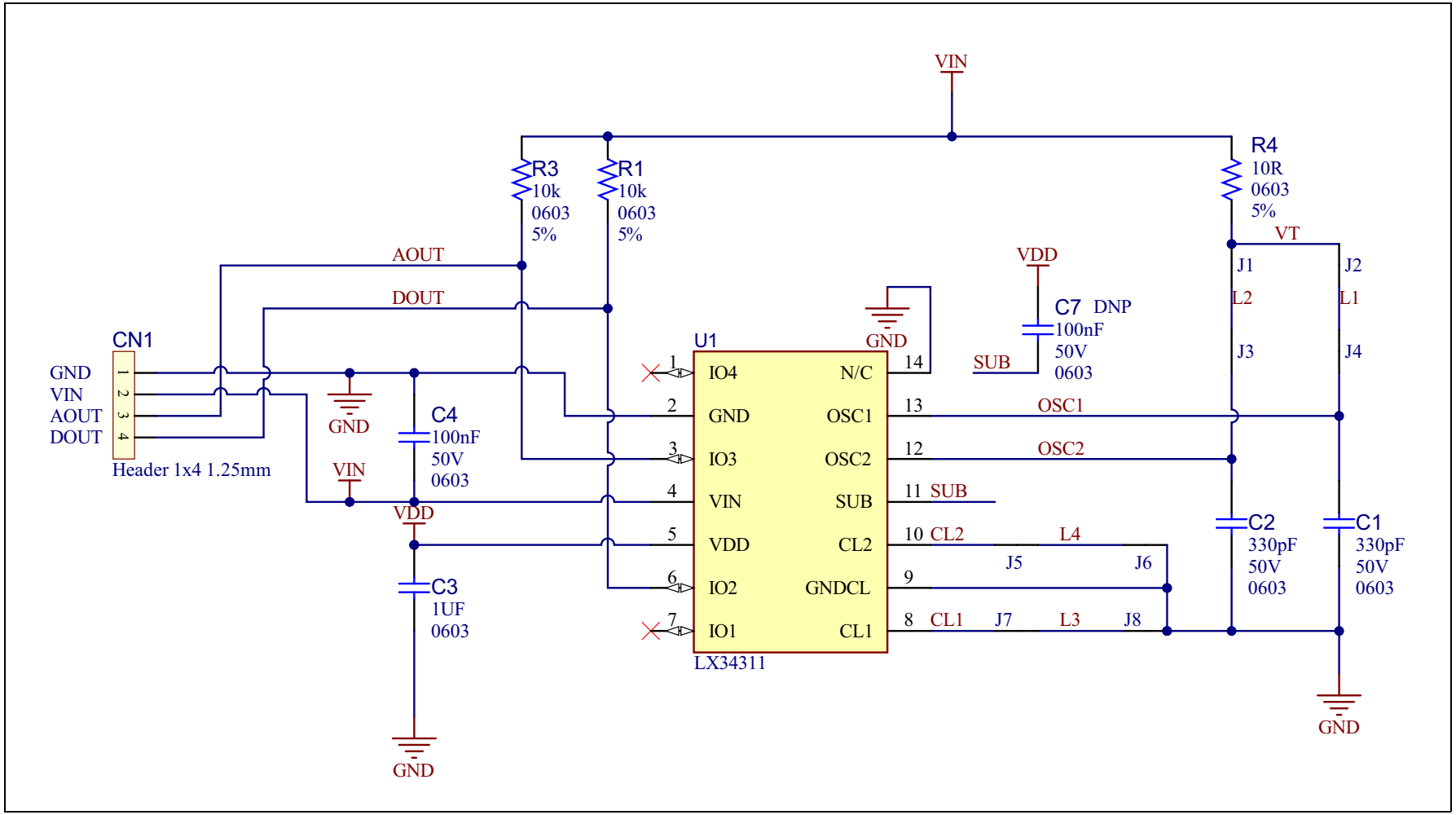
A.2 BOARD – SCHEMATIC



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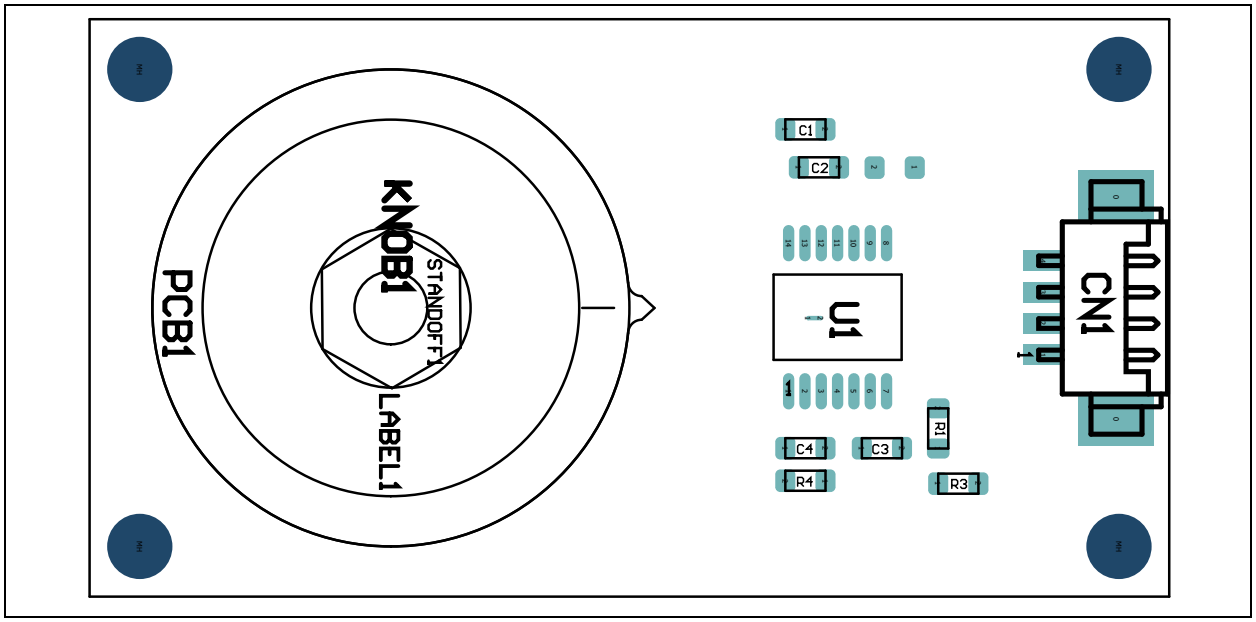
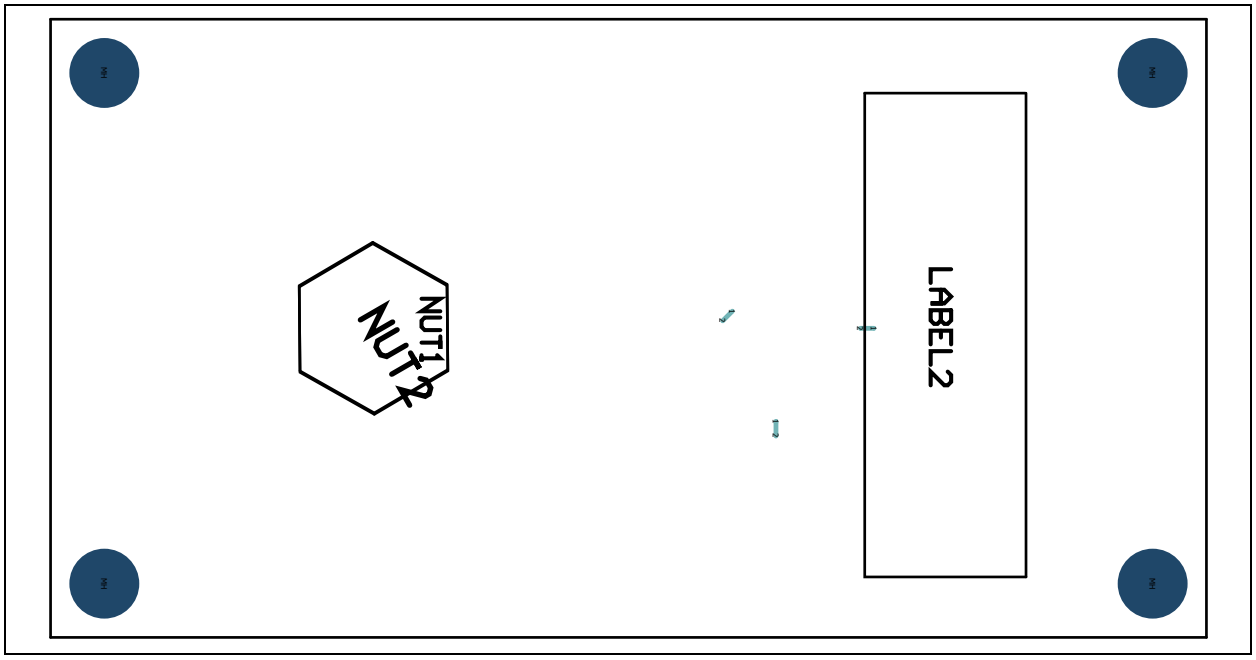
A.3 BOARD – TOP ASSEMBLY



A.4 BOARD – BOTTOM ASSEMBLY



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Appendix B. Bill of Materials (BOM)

TABLE B-1: BILL OF MATERIALS (BOM)

Qty.	Reference	Description	Manufacturer	Part Number
2	C1, C2	Capacitor, ceramic, 330p F, 50V, 5%, C0G, SMD, 0603	KEMET	C0603C331J5GACTU
1	C3	Capacitor, ceramic, 1UF, 6.3V, X7R, 0603	KEMET	C0603C105K9RACTU
1	C4	Capacitor, ceramic, 100 nF, 50V, 10%, X7R, AEC-Q200, SMD, 0603	KYOCERA AVX	06035C104K4T2A
1	C7	Capacitor, ceramic, 100 nF, 50V, 10%, X7R, AEC-Q200, SMD, 0603 — **Do Not Populate**	KYOCERA AVX	06035C104K4T2A
1	CABLE1	LXM9518 Programmer 4 pin Cable Assembly	Microchip Technology Inc.	**07-10006**
1	CN1	Connector, Header-1.25, Male, 1X4 Shroud, SMD, R/A	Molex®, LLC	0532610471
1	PCB1	Inductive Sensor, Rotary Target, PCB, D19 mm, 120 degree lobes	Microchip Technology Inc.	**04-11177**
1	PCB1	Printed Circuit Board — LX34311 Inductive Position Sensor Evaluation Board/Kit	Microchip Technology Inc.	**04-12202-R1**
1	PCBA1	PCB Assembly	Microchip Technology Inc.	**02-01137-R1**
2	R1, R3	Resistor, TKF, 10k, 5%, 1/10W, SMD, 0603	Panasonic® — ECG	ERJ-3GEYJ103V
1	R4	Resistor, TKF, 10R, 5%, 1/10W, SMD, 0603	Panasonic — ECG	ERJ-3GEYJ100V
1	U1	Microchip, Analog, Inductive Sensor LX34311, TSSOP-14, AEC-Q100	Microchip Technology Inc.	**LX34311T-H/STVAO**

Note 1: The components listed in this Bill of Materials are representative of the PCB assembly. The released BOM used in manufacturing uses all RoHS-compliant components.

TABLE B-2: BILL OF MATERIALS — MECHANICAL PARTS

Qty.	Reference	Description	Manufacturer	Part Number
1	GLUE1	Glue Loctite Super Glue Ultra Liquid Control 4g	Loctite®	1647358
1	KNOB1	Mechanical, Knob, Cylindrical with Skirt, D19H12, 1/4inch Shaft with fixing screw, Phenolic	Apem Inc.	MPKES60B1/4
0.005	LABEL1	Mechanical, hardware, Reinforcement Labels, Clear, 6.35 mm	Avery Labels	5721
1	LABEL2	Label, PCBA, 18x6 mm, Datamatrix Assy# / Rev / Serial / Date	ACT Logimark AS	505462
2	NUT1, NUT2	Mechanical, hardware, Nut, M3x2.4 mm, Polyamide	Bossard	M3/BN81
1	STANDOFF1	Mechanical, hardware, Stand-Off, M3x9 mm, M/F, Thread, 6 mm, Hex, 5.5 mm, Nylon	Essentra plc	CBMFTS230A

Note 1: The components listed in this Bill of Materials are representative of the PCB assembly. The released BOM used in manufacturing uses all RoHS-compliant components.

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