Inductive Position Sensor Pro Evaluation Kit User's Guide

Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specifications contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is secure when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods being used in attempts to breach the code protection features of the Microchip devices. We believe that these methods require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Attempts to breach these code protection features, most likely, cannot be accomplished without violating Microchip's intellectual property rights.
- Microchip is willing to work with any customer who is concerned about the integrity of its code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of its code. Code protection does not mean that we are guaranteeing the product is "unbreakable." Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

For information regarding Microchip's Quality Management Systems, please visit www.microchip.com/quality.

Trademarks

ISBN: 978-1-5224-7654-2

Table of Contents

NOTES:

Preface

NOTICE TO CUSTOMERS

All documentation becomes dated, and this manual is no exception. Microchip tools and documentation are constantly evolving to meet customer needs, so some actual dialogs and/or tool descriptions may differ from those in this document. Please refer to our website (www.microchip.com) to obtain the latest documentation available.

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. Select the Help menu, and then Topics, to open a list of available online help files.

INTRODUCTION

This chapter contains general information that will be useful to know before using the Inductive Position Sensor Pro Evaluation 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 Inductive Position Sensor Pro Evaluation Kit as a development tool to emulate and debug firmware on a target board. The manual layout is as follows:

- **Chapter 1. "Product Overview"** – This chapter contains important information about the Inductive Position Sensor Pro Evaluation Kit.
- **Chapter 2. "Installation"** – This chapter describes how to use the Inductive Position Sensor Pro Evaluation Kit.

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`
	Filenames	`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's guide describes how to use the Inductive Position Sensor Pro Evaluation Kit. Other useful and supplemental documents will be listed here when it becomes available.

THE MICROCHIP WEBSITE

Microchip provides online support via our website at www.microchip.com. This website is used as a means to make files and information easily available to customers. Accessible by using your favorite Internet browser, the website contains the following information:

- **Product Support** – Data sheets and errata, application notes and sample programs, design resources, user's guides and hardware support documents, latest software releases and archived software
- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip consultant program member listing
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

PRODUCT CHANGE NOTIFICATION SERVICE

Microchip's customer notification service helps keep customers current on Microchip products. Subscribers will receive email notifications whenever there are changes, updates, revisions or errata related to a specified product family or development tool of interest.

To register, access the Microchip website at www.microchip.com, click on **Product Change Notification** and follow the registration instructions.

CUSTOMER SUPPORT

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

Customers should contact their distributor, representative or field application engineer (FAE) for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in the back of this document.

Technical support is available through the website at:
http://www.microchip.com/support.

DOCUMENT REVISION HISTORY

Revision A (February 2021)

- Initial release of this document.

NOTES:

Chapter 1. Product Overview

1.1 INTRODUCTION

The LX3302AQPW and LX3301AQPW ICs are a low-cost, high-accuracy and superior magnetic noise immune position sensor integrated circuits (ICs). The sensor system consists of the inductive position sensor ICs, its printed circuit board sensor and the target. A target metal is attached to the moving mechanical housing, which provides position relative to the fixed position of sensor Printed Circuit Board (PCB).

The inductive PCBs are constructed using printed circuit board material.

The sensor assembly is connected to the USB IPCE programmer interface through a four-wire cable carrying +5V, GND, IO2 (DOUT) and IO3 (AOUT). The IPCE programmer allows programming of LX3302AQPW and LX3301AQPW internal configuration EEPROM.

1.2 FEATURES

1.2.1 Inductive Position Sensor Pro Evaluation Kit Contents

The Evaluation Kit contains the following items:

- Inductive position sensor PCB with target assembly
- IPCE interface programmer
- 4-pin cable
- USB power cable
- The IPCE software can be downloaded from www.microchip.com

Figure 1-1 shows an example of the LX3302A Pro Sensor Kit.

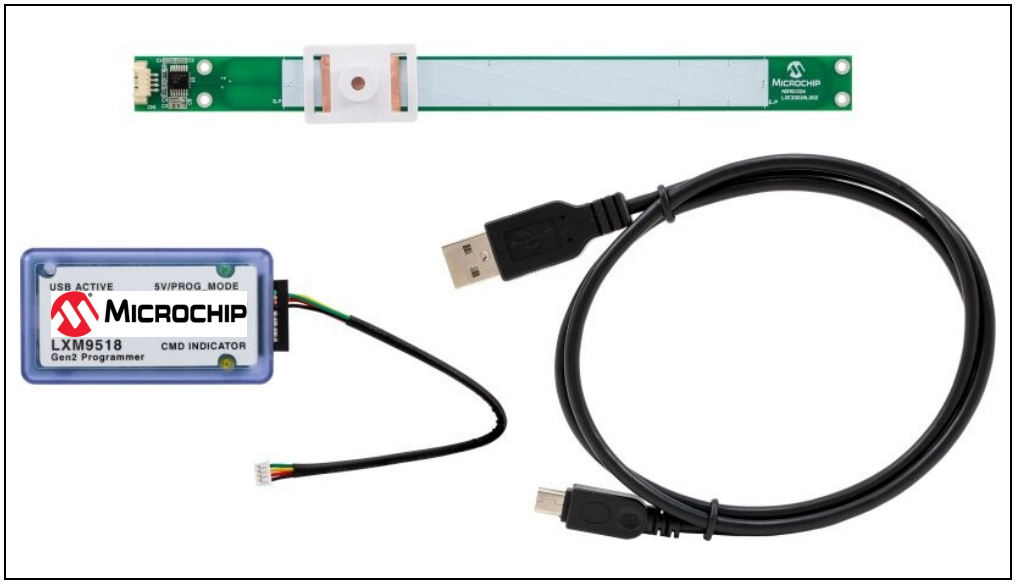

FIGURE 1-1: *LX3302A Pro Sensor Kit Example (LXK3302AL002).*

1.3 SYSTEM OPERATION

The Inductive Position Sensor Pro Evaluation Kit has been factory calibrated and is ready to use. The default operation requires a +5V DC power source which can be supplied either by an external DC power supply or the ICPE programmer connected to PC via USB.

The evaluation kit constitutes 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 representative of the relative difference between the CL1 and CL2 signals, see Figure 1-2.

The values of the two OSC1 and OSC2 capacitors vary depending on the characteristics of the OSC1 and OSC2 printed circuit board layout pattern. The combination L/C impedance of the printed circuit board layout is matched to the LX3302AQPW and LX3301AWPW oscillation requirement. Refer to the *LX3302A* (DS20006306) and *LX3301A* (DS20006387) *Data Sheets* for more design parameters.

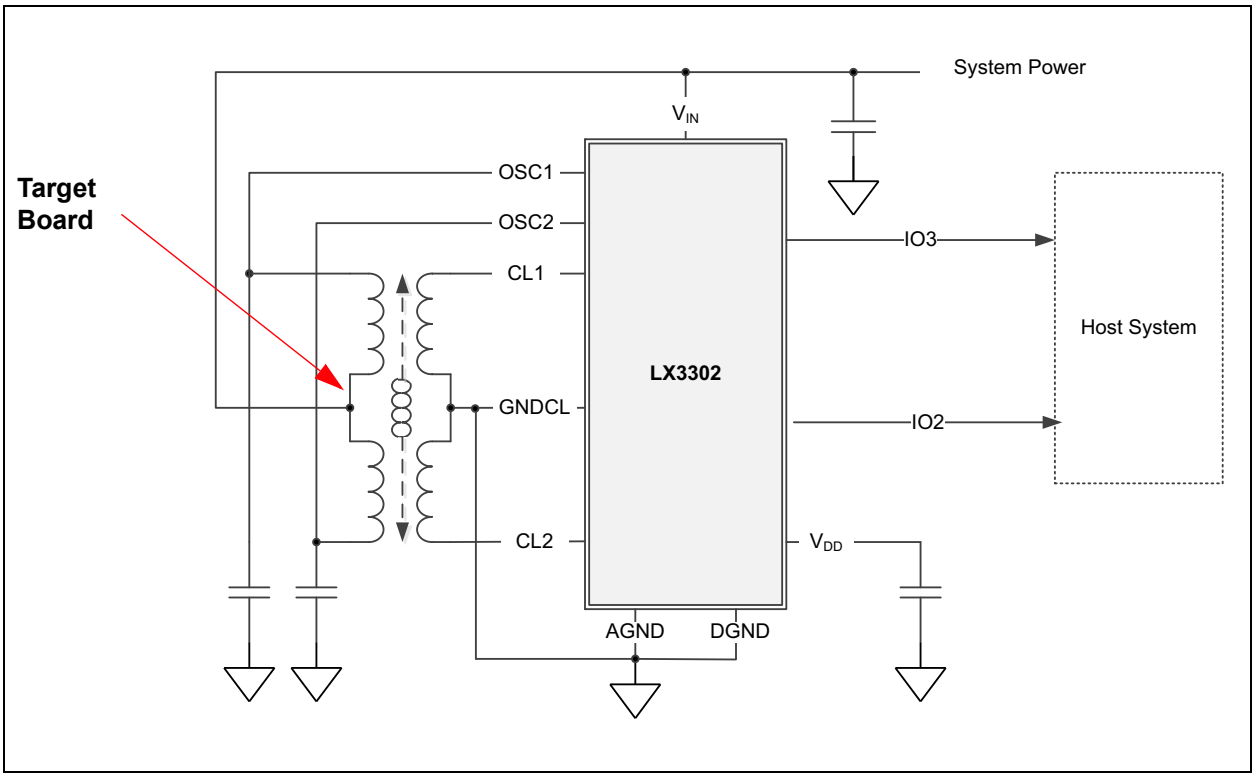

FIGURE 1-2: *Inductive Sensor Operation Principle.*

Chapter 2. Installation

2.1 4-PIN TO 10-PIN CONNECTOR BETWEEN SENSOR BOARD AND PROGRAMMER

FIGURE 2-1: *4-Pin to 10-Pin Connector.*

Figure 2-1 shows the required external system equipment and their respective connections to the LX3302A Evaluation Board. The sensor assembly comes with a 4-pin (CN1) to 10-pin (CN2) connector to connect the sensor to the IPCE programmer. Table 2-1 and Table 2-2 show the pinout of this connector.

TABLE 2-1: CN1 PINOUT CONNECTOR (MOLEX PART NUMBER: 151340400)

Pin#	Pin Name	Functional Description
1	GND	Ground
2	V_{IN}	+5V Supply/Internal EEPROM programming. Refer to either *LX3302A Data Sheet* or *LX3301A Data Sheet* for details.
3	IO3 (AOUT)	LX3302AQPW IO3 output can be programmed to analog/PWM/SENT/PSI5/TD output. Refer to the *LX3302AQPW Data Sheet*. (LX3301AQPW AOUT output is the Analog/PWM/TD) Refer to the *LX3301AQPW Data Sheet*.
4	IO2 (DOUT)	LX3302AQPW IO2 output can be programmed to PWM/SENT. (LX3301AQPW DOUT output is the PWM/TD)

TABLE 2-2: CN2 CONNECTOR PINOUT (3M M1DXA-1036J)

Pin#	Pin Name	Functional Description
1	IO2 (DOUT)	LX3302AQPW IO2 output can be programmed to PWM/SENT. (LX3301AQPW DOUT output is the PWM/TD)
2	IO3 (AOUT)	LX3302AQPW IO3 output can be programmed to analog/PWM/SENT/PSI5/TD output. Refer to the *LX3302AQPW Data Sheet*. (LX3301AQPW AOUT output is the Analog/PWM/TD) Refer to the *LX3301AQPW Data Sheet*.
3	V_{IN}	+5V Supply/Internal EEPROM programming. Refer to either *LX3302A Data Sheet* or *LX3301A Data Sheet* for details.

TABLE 2-2: CN2 CONNECTOR PINOUT (3M M1DXA-1036J) (CONTINUED)

Pin#	Pin Name	Functional Description
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

2.2 INDUCTIVE SENSOR BOARD TYPICAL CHARACTERISTICS

The plot in Figure 2-2 displays an example of linearity achievable with the inductive sensor with an analog output. Other output formats will have the same accuracy.

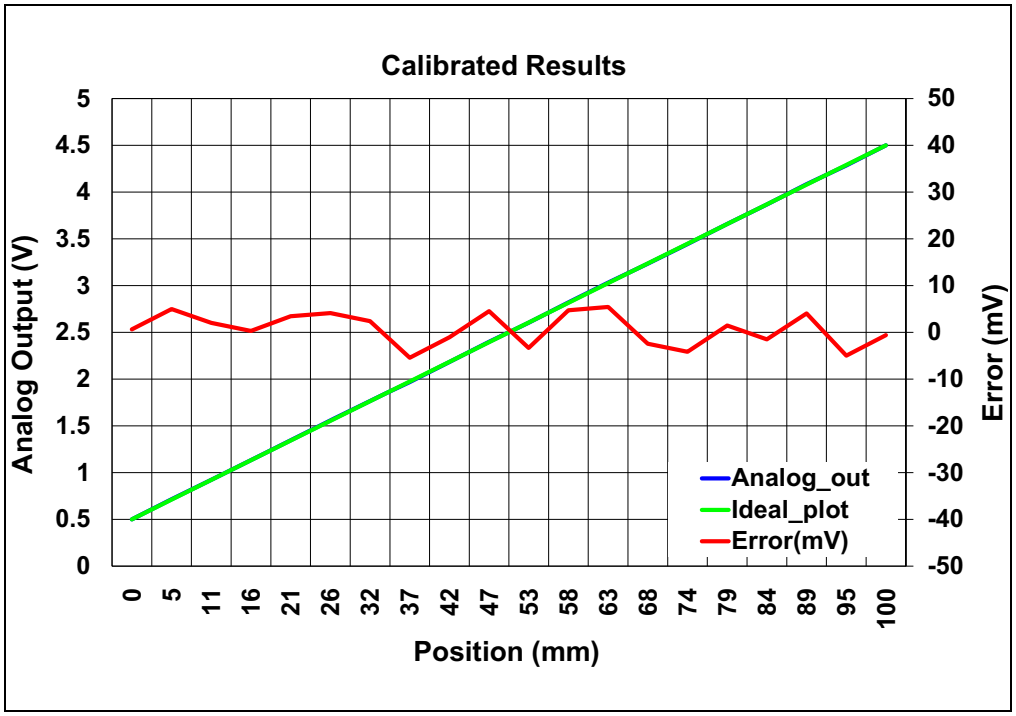

FIGURE 2-2: *An Example of Typical Inductive Sensor Board Linearity (Calibrated).*

2.3 CONFIGURATION EEPROM

The measurement IC contains an internal EEPROM for storing Calibration and Configuration parameters. The Calibration parameters enable the production sensor assembly to be factory calibrated ensuring consistent unit-to-unit performance.

2.4 KIT EEPROM PROGRAMMING IPCE

The sensor 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.

2.4.1 IPCE Installation and Startup

1. To download the IPCE software, acess the *Sensor Evaluation and Calibration Software (2.x)* from the LX3301A or LX3302A product page.
2. Install the program.
3. Once connected, the dongle status will indicate that the port is open and detects the Evaluation Board (EVB).
4. The voltages or digital signals from each output are displayed in the live update section of the IPCE tool.

NOTES:

Worldwide Sales and Service

AMERICAS

Corporate Office
2355 West Chandler Blvd.
Chandler, AZ 85224-6199
Tel: 480-792-7200
Fax: 480-792-7277
Technical Support:
http://www.microchip.com/support
Web Address:
www.microchip.com

Atlanta
Duluth, GA
Tel: 678-957-9614
Fax: 678-957-1455

Austin, TX
Tel: 512-257-3370

Boston
Westborough, MA
Tel: 774-760-0087
Fax: 774-760-0088

Chicago
Itasca, IL
Tel: 630-285-0071
Fax: 630-285-0075

Dallas
Addison, TX
Tel: 972-818-7423
Fax: 972-818-2924

Detroit
Novi, MI
Tel: 248-848-4000

Houston, TX
Tel: 281-894-5983

Indianapolis
Noblesville, IN
Tel: 317-773-8323
Fax: 317-773-5453
Tel: 317-536-2380

Los Angeles
Mission Viejo, CA
Tel: 949-462-9523
Fax: 949-462-9608
Tel: 951-273-7800

Raleigh, NC
Tel: 919-844-7510

New York, NY
Tel: 631-435-6000

San Jose, CA
Tel: 408-735-9110
Tel: 408-436-4270

Canada - Toronto
Tel: 905-695-1980
Fax: 905-695-2078

ASIA/PACIFIC

Australia - Sydney
Tel: 61-2-9868-6733

China - Beijing
Tel: 86-10-8569-7000

China - Chengdu
Tel: 86-28-8665-5511

China - Chongqing
Tel: 86-23-8980-9588

China - Dongguan
Tel: 86-769-8702-9880

China - Guangzhou
Tel: 86-20-8755-8029

China - Hangzhou
Tel: 86-571-8792-8115

China - Hong Kong SAR
Tel: 852-2943-5100

China - Nanjing
Tel: 86-25-8473-2460

China - Qingdao
Tel: 86-532-8502-7355

China - Shanghai
Tel: 86-21-3326-8000

China - Shenyang
Tel: 86-24-2334-2829

China - Shenzhen
Tel: 86-755-8864-2200

China - Suzhou
Tel: 86-186-6233-1526

China - Wuhan
Tel: 86-27-5980-5300

China - Xian
Tel: 86-29-8833-7252

China - Xiamen
Tel: 86-592-2388138

China - Zhuhai
Tel: 86-756-3210040

ASIA/PACIFIC

India - Bangalore
Tel: 91-80-3090-4444

India - New Delhi
Tel: 91-11-4160-8631

India - Pune
Tel: 91-20-4121-0141

Japan - Osaka
Tel: 81-6-6152-7160

Japan - Tokyo
Tel: 81-3-6880- 3770

Korea - Daegu
Tel: 82-53-744-4301

Korea - Seoul
Tel: 82-2-554-7200

Malaysia - Kuala Lumpur
Tel: 60-3-7651-7906

Malaysia - Penang
Tel: 60-4-227-8870

Philippines - Manila
Tel: 63-2-634-9065

Singapore
Tel: 65-6334-8870

Taiwan - Hsin Chu
Tel: 886-3-577-8366

Taiwan - Kaohsiung
Tel: 886-7-213-7830

Taiwan - Taipei
Tel: 886-2-2508-8600

Thailand - Bangkok
Tel: 66-2-694-1351

Vietnam - Ho Chi Minh
Tel: 84-28-5448-2100

EUROPE

Austria - Wels
Tel: 43-7242-2244-39
Fax: 43-7242-2244-393

Denmark - Copenhagen
Tel: 45-4485-5910
Fax: 45-4485-2829

Finland - Espoo
Tel: 358-9-4520-820

France - Paris
Tel: 33-1-69-53-63-20
Fax: 33-1-69-30-90-79

Germany - Garching
Tel: 49-8931-9700

Germany - Haan
Tel: 49-2129-3766400

Germany - Heilbronn
Tel: 49-7131-72400

Germany - Karlsruhe
Tel: 49-721-625370

Germany - Munich
Tel: 49-89-627-144-0
Fax: 49-89-627-144-44

Germany - Rosenheim
Tel: 49-8031-354-560

Israel - Ra'anana
Tel: 972-9-744-7705

Italy - Milan
Tel: 39-0331-742611
Fax: 39-0331-466781

Italy - Padova
Tel: 39-049-7625286

Netherlands - Drunen
Tel: 31-416-690399
Fax: 31-416-690340

Norway - Trondheim
Tel: 47-7288-4388

Poland - Warsaw
Tel: 48-22-3325737

Romania - Bucharest
Tel: 40-21-407-87-50

Spain - Madrid
Tel: 34-91-708-08-90
Fax: 34-91-708-08-91

Sweden - Gothenberg
Tel: 46-31-704-60-40

Sweden - Stockholm
Tel: 46-8-5090-4654

UK - Wokingham
Tel: 44-118-921-5800
Fax: 44-118-921-5820

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for Position Sensor Development Tools ***category:***

Click to view products by Microchip ***manufacturer:***

Other Similar products are found below :

AS5115 PB SCA830-D07-PCB STEVAL-MKI043V1 EVB90340-LDC-200-Rev1.0 STEVAL-STWINMAV1 1032 178 DPP401Z000 EVAL-ADXRS453Z-M EVAL-ADXRS453Z-V 1007214-3 STEVAL-MKI045V1 STEVAL-MKI042V1 STEVAL-MKI037V1 IMX-070 164 3595 AS5161-EK-AB AS5200L-MF_EK_AB AS5215 DB AS5600L-SO_EK_AB AS5600L-WL_EK_AB AS5715-TS_EK_AB AS5X47D-TO_EK_ST TRK-1T02-E ADIS16265/PCBZ ADIS16260/PCBZ EVAL-ADIS2Z EVAL-ADXRS453Z EVAL-ADXRS453Z-S EVAL-ADXRS646Z EVAL-ADXRS800Z-EY EVAL-ADXRS800Z-M EVAL-ADXRS800Z-RG EVAL-CN0341-SDPZ ATBNO055-XPRO DFR0027 DFR0053 DPP401A000 EVB90365-Rev1.0 EVB90371-GDC-100-Rev1.0 EVB90371-GDC-200-Rev1.0 EVB90371-GDC-300-Rev1.0 EVB90371-GGO-100-Rev1.0 EVB90371-GGO-200-Rev1.0 EVB90371-GGO-300-Rev1.0 EVB90380 End of Shaft - Rev1.0 AC243007 DM160217 DM160218