DESCRIPTION

The EVKT-MACOM is a communication kit for the MagAlpha magnetic position sensor family. The EVKT-MACOM offers a seamless connection and operation with MagAlpha test boards (TBMA) and evaluation kits (EVKT-KNOB). The EVKT-MACOM kit contains a microcontroller motherboard, a collection of daughter boards adapted to different sensor boards, and the related cables.

FEATURES

- USB 2.0 High-Speed Interface
- LPC4370, ARM Cortex-M4 Microcontroller from NXP
- Connector Board to Interface with TBMA Test Boards (TBMA-CONN)
- Connector Board to Interface with EVMA Test Kits (EVMA-CONN)
- Compatible with Macom Application Software (MACOM App)

APPLICATIONS

- Sensor Tests and Evaluation
- Performance Characterization
- Production Configurations and Tests

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OVERVIEW

Figure 1: EVKT-MACOM with EVMA-CONN Daughter Board
KIT CONTENTS
See Figure 2 for a list of EVKT-MACOM communication kit contents.

Figure 2: Kit Contents

1. 1x LPC-Link2 board with LPC4370 microcontroller from NXP
2. 1x TBMA-CONN board (LPC-Link2 daughterboard)
3. 1x EVMA-CONN board (LPC-Link2 daughterboard)
4. 1x USB cable (Type A to Type Mini-B)
5. 1x 16 conductors ribbon cable
6. 2x 8 conductors ribbon cable
7. 2x Würth Elektronik female SMT WR-MM 8 pin connector (690367280876) for the TBMA
EVMA CONNECTOR BOARD (EVMA-CONN)

See Figure 3 for an overview of the EVMA board.

SCHEMATIC

The schematics for Rev B and Rev C of the EVMA-CONN are shown in Figure 4.
ASSEMBLY VIEW

Figure 5 shows the assembly view of Rev B.

Figure 6 shows the assembly view of Rev C.
BILL OF MATERIALS

Both board versions share the same bill of materials (see Table 1).

Table 1: Bill of Materials EVMA-CONN Rev B and Rev C

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Designator</th>
<th>Description</th>
<th>Value</th>
<th>Manufacturer</th>
<th>Manufacturer PN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>R1</td>
<td>Chip resistor; 0.125W; 0805 (2012 Metric)</td>
<td>0Ω</td>
<td>Yageo</td>
<td>ERJ-6GEY0R00V</td>
</tr>
<tr>
<td>1</td>
<td>J3</td>
<td>14 Position Receptacle Connector 0.050&quot; (1.27mm), Surface Mount Gold</td>
<td></td>
<td>Amphenol FCI</td>
<td>20021321-00014T4LF</td>
</tr>
<tr>
<td>1</td>
<td>J9</td>
<td>24 Position Receptacle Connector 0.050&quot; (1.27mm), Surface Mount Gold</td>
<td></td>
<td>Amphenol FCI</td>
<td>20021321-00024T4LF</td>
</tr>
<tr>
<td>2</td>
<td>J4, J8 (optional)</td>
<td>20 Position Receptacle Connector 0.050&quot; (1.27mm), Surface Mount Gold</td>
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<td>Amphenol FCI</td>
<td>20021321-00020C4LF</td>
</tr>
<tr>
<td>1</td>
<td>J10 (optional)</td>
<td>12 Positions, Header, Breakaway Connectors, 0.100&quot; (2.54mm), Surface Mount Gold</td>
<td></td>
<td>Molex</td>
<td>0015910120</td>
</tr>
<tr>
<td>1</td>
<td>CN1</td>
<td>16 Position Receptacle Connector 0.100&quot; (2.54mm), Surface Mount Tin</td>
<td></td>
<td>Würth Elektronik or TE Connectivity</td>
<td>690367281676 or 8-2178711-6</td>
</tr>
</tbody>
</table>

CONNECTOR PINOUT

Refer to the EVKT-KNOB user guide for CN1 pin mapping.
TBMA CONNECTOR BOARD (TBMA-CONN)

See Figure 7 for an overview of the TBMA board.

The board schematics are shown in Figure 8 and Figure 10. The assembly views are shown in Figure 9 and Figure 11. According to the board marking, refer to Figure 8 for the Rev B schematic or Figure 10 for the Rev C schematic.

Schematic Rev B

Figure 8: Schematic TBMA-CONN Rev B
Assembly View Rev B

View from Top side

View from Bottom side

Figure 9: Assembly TBMA-CONN Rev B

Schematic Rev C

+3.3V MCU

Optional

J3

+3.3V MCU

Optional

J4

+3.3V MCU

Optional

J8

+3.3V MCU

Optional

J9

Figure 10: Schematic TBMA-CONN Rev C
Assembly View Rev C

Figure 11: Assembly TBMA-CONN Rev C
BILL OF MATERIALS

Both board versions share the same bill of materials (see Table 2).

Table 2: Bill of Materials TBMA-CONN Rev B and Rev C

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Designator</th>
<th>Description</th>
<th>Value</th>
<th>Manufacturer</th>
<th>Manufacturer PN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>R1</td>
<td>Chip resistor; 0.125W; 0805 (2012 Metric)</td>
<td>0Ω</td>
<td>Yageo</td>
<td>ERJ-6GEY0R00V</td>
</tr>
<tr>
<td>1</td>
<td>J3</td>
<td>14 Position Receptacle Connector 0.050&quot; (1.27mm), Surface Mount Gold</td>
<td></td>
<td>Amphenol FCI</td>
<td>20021321-00014T4LF</td>
</tr>
<tr>
<td>1</td>
<td>J9</td>
<td>24 Position Receptacle Connector 0.050&quot; (1.27mm), Surface Mount Gold</td>
<td></td>
<td>Amphenol FCI</td>
<td>20021321-00024T4LF</td>
</tr>
<tr>
<td>2</td>
<td>J4, J8 (optional)</td>
<td>20 Position Receptacle Connector 0.050&quot; (1.27mm), Surface Mount Gold</td>
<td></td>
<td>Amphenol FCI</td>
<td>20021321-00020C4LF</td>
</tr>
<tr>
<td>1</td>
<td>J10 (optional)</td>
<td>12 Positions, Header, Breakaway Connectors, 0.100&quot; (2.54mm), Surface Mount Gold</td>
<td></td>
<td>Molex</td>
<td>0015910120</td>
</tr>
<tr>
<td>2</td>
<td>CN1, CN2</td>
<td>8 Position Receptacle Connector 0.100&quot; (2.54mm), Surface Mount Tin</td>
<td></td>
<td>Würth Elektronik or TE Connectivity</td>
<td>690367280876 or 7-2178711-8</td>
</tr>
</tbody>
</table>

CONNECTOR PINOUT

Refer to the TBMA user guide for CN1 and CN2 pin mapping.
MAGALPHA COMMUNICATION KIT SETUP

Follow the steps below to set up the MagAlpha communication kit.

1. **Install Macom Application Software**
   
   To find the Macom app, visit the Position Sensors Design Support page on the Monolithic Power Systems website ([www.monolithicpower.com](http://www.monolithicpower.com)).

2. **Configure the LPC-Link2 Board in Flash Boot Mode**
   
   Plug the jumper onto JP1 to configure the microcontroller in flash boot mode (see Figure 12). In this mode, the microcontroller loads the firmware binary stored in the flash.

\[ \text{Figure 12: Configure LPC-Link2 in Flash Boot Mode} \]

3. **Plug Connector Board onto the LPC-Link2**
   
   Carefully plug the desired connector board to the LPC-Link2 (see Figure 13). Ensure that the female headers are correctly aligned with the LPC-Link2 pins before connecting the two boards together (see Figure 14).

\[ \text{Figure 13: Plug Connector Board to the LPC-Link2}\]

\[ \text{Figure 14: Assembled LPC-Link2 with TBMA-CONN Daughter Board}\]
4. **Connect Daughter Board To The Sensor Board (EVKT-KNOB or TBMA)**

Use the provided ribbon cable to connect the connector board to the sensor board.

The EVKT-KNOB comes with a pre-soldered female socket connector, while TBMA boards do not. The TBMA boards require the female connectors to be hand soldered in order to be used with the EVKT-MACOM. Before soldering, place the connector polarization slot next to pin 1 (see Figure 15).

**Figure 15: Solder Connectors CN1 and CN2 to TBMA**

On the TBMA boards (RD and LT), the CN1 connector must be connected to the TBMA-CONN CN1 connector using one of the two provided ribbon cable with 8 conductors (see Figure 16 and Figure 17). The CN2 connection is not required for SPI communication but provides easy access to the MagAlpha output signals on the LPC-Link2 daughter board.

**Figure 16: Connect TBMA-RD to TBMA-CONN Board**

**Figure 17: Connect TBMA-LT to TBMA-CONN Board**
On the EVKT-KNOB, the CN1 connector must be connected to the EVMA-CONN CN1 connector (see Figure 18 and Figure 19).

**Figure 18: Connect EVKT-KNOB to EVMA-CONN Board (Top View)**

**Figure 19: Connect EVKT-KNOB to EVMA-CONN Board (Side View)**

5. **Connect LPC-Link2 to Computer**
   Connect the LPC-Link2 board to the computer using the provided USB cable (Type A to Type Mini-B) (see Figure 20). The red LED (LED1) on the LPC-Link2 should blink.

**Figure 20: Connect LPC-Link2 to Computer**

6. **Start Macom App**
   Launch the Macom App from the start menu (See Figure 21).

**Figure 21: Start Macom App**
Angle data should be displayed right away (see Figure 22).

Figure 22: Overview of Macom App Graphical Interface
MACOM APP

The Macom software is a powerful and easy-to-use application used to interact with the MagAlpha sensor family. The Macom app provides a graphical visualization of the angle output and a convenient way to read and write sensor parameters. This app also offers the following features:

- Register map overview (read/write sensor registers)
- Import configuration script (JSON)
- Export current configuration (JSON)
- Save measurement data
- Update EVKT-MACOM firmware (stored on LPC-Link2 flash)
- Sensor auto discovery (automatic detection of the available parameters and of the sensor generation)

The Macom graphical user interface is divided in three areas: the toolbar, the angle readback, and the sensor parameters.

1. Toolbar

![Toolbar Image](image-url)

**Figure 23: Macom App Toolbar**

<table>
<thead>
<tr>
<th>Feature Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection</td>
<td>Switch the USB connection to the EVKT-MACOM on or off. This feature also launches a sensor auto-discovery when the connection is switched ON (see Sensor Parameters section on page 15).</td>
</tr>
<tr>
<td>Save Data</td>
<td>Saves the latest 2000 measured angles in a CSV file. This file can be also open natively by any spreadsheet applications (e.g.: Microsoft Excel).</td>
</tr>
<tr>
<td>Registers</td>
<td>Switch the registers overview window display on or off (see Figure 24). This window provides the overview of the complete register map at a glance. Users can switch between decimal, hexadecimal, and binary register value representation by using the dropdown button. It is also possible to refresh all registers value by clicking the Read button.</td>
</tr>
<tr>
<td>Import</td>
<td>Import sensor register settings and/or Macom configurations from a JSON file.</td>
</tr>
<tr>
<td>Export</td>
<td>Export sensor register settings and Macom configurations to a JSON file.</td>
</tr>
<tr>
<td>Update Firmware</td>
<td>Update the LPC-Link2 microcontroller firmware. To perform a firmware update, click on this feature and follow the step-by-step instructions displayed on the firmware update wizard.</td>
</tr>
</tbody>
</table>
Figure 24: Macom App Registers Overview Feature

2. Angle Readback

<table>
<thead>
<tr>
<th>Feature Name</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>Raw Input</td>
<td>Measured angle value coded on 16 bits (0 to 65535) and in degrees (0 to 360).</td>
</tr>
<tr>
<td>Resolution</td>
<td>Gives 6σ resolution in bits (n) and 3σ resolution in degrees (m). This means that 99.7% of the measurement performed on this sensor will have the same n MSB bits and will be within ± m degrees from the latest angle measurement.</td>
</tr>
</tbody>
</table>
3. **Sensor Parameters**

The user-configurable parameters are defined during the auto-discovery process. This process occurs at Macom App start-up or when a disconnection/connection cycle occurs. The software discovers which sensor generation is connected automatically and finds out which parameters are available for this specific product (see Figure 26).

![Sensor Parameters](image)

**Figure 26: Macom App Sensor Parameters**

A connection cycle is required after a sensor hot swap (connecting or unplugging the sensor while the system is on) in order to re-run the auto-discovery process on the freshly connected sensor.

To perform a connection cycle, simply click on connection twice: once to disconnect the device and again to reconnect it.

![Connection Cycle](image)

**Figure 27: Macom App Connection Cycle**
APPENDIX A: SENSOR GENERATION

See Table 3 for a list of sensor generations and their corresponding MPS part numbers.

<table>
<thead>
<tr>
<th>Sensor Generation</th>
<th>MPS Chip Part Number</th>
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<tr>
<td>2\textsuperscript{nd} (Gen 2)</td>
<td>MA100</td>
</tr>
<tr>
<td></td>
<td>MA300</td>
</tr>
<tr>
<td></td>
<td>MA700</td>
</tr>
<tr>
<td></td>
<td>MA750</td>
</tr>
<tr>
<td>3\textsuperscript{rd} (Gen 3)</td>
<td>MA102</td>
</tr>
<tr>
<td></td>
<td>MA302</td>
</tr>
<tr>
<td></td>
<td>MA310</td>
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