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eCompass component user manual

Rev. 1 — 28 January 2021

Document information

Information	Content
Keywords	Component Library, ECompass
Abstract	Getting started with eCompass component

1 Prerequisites

Prior to using this platform agnostic component library, the eCompass component, this document assumes the user is familiar with the:

- Chosen microcontroller unit (MCU),
- Corresponding software development kit (SDK), and
- Cross-compilation tool chain to integrate eCompass component.
- MCU SDK implementation for underlying microcontroller peripherals such as I^{2}C and SPI in order to integrate with the sensor driver component.

2 Overview

eCompass component is a development model that provides an eCompass algorithm implementation using 3-axis accelerometer and 3-axis magnetometer with platform independent interfaces. The platform interface provides abstraction to the underlying communication driver in the SDK, tool chains, and MCUs.

2.1 eCompass component design

This component provides an example algorithm of measuring a tilt-compensated eCompass using an accelerometer to compensate for magnetometer variations with tilt angle and calibrating the magnetometer for interference caused by ferromagnetic material or equipment in the vicinity of the magnetometer (hard iron compensation). The platform interface provides abstraction to th underlying communication driver in microcontroller SDK, tool chains, and host operating system. The component of the sensor driver provides abstraction of the sensors (accelerometer and magnetometer) driver for which a specific communication interface is defined. The component runs as a standalone application space in the application space or runs in a multi-threaded environment where the user application is responsible for handling the multi-threading synchronization and resource handling. It is designed to work seamlessly in any SDK environment and application resource handlers.
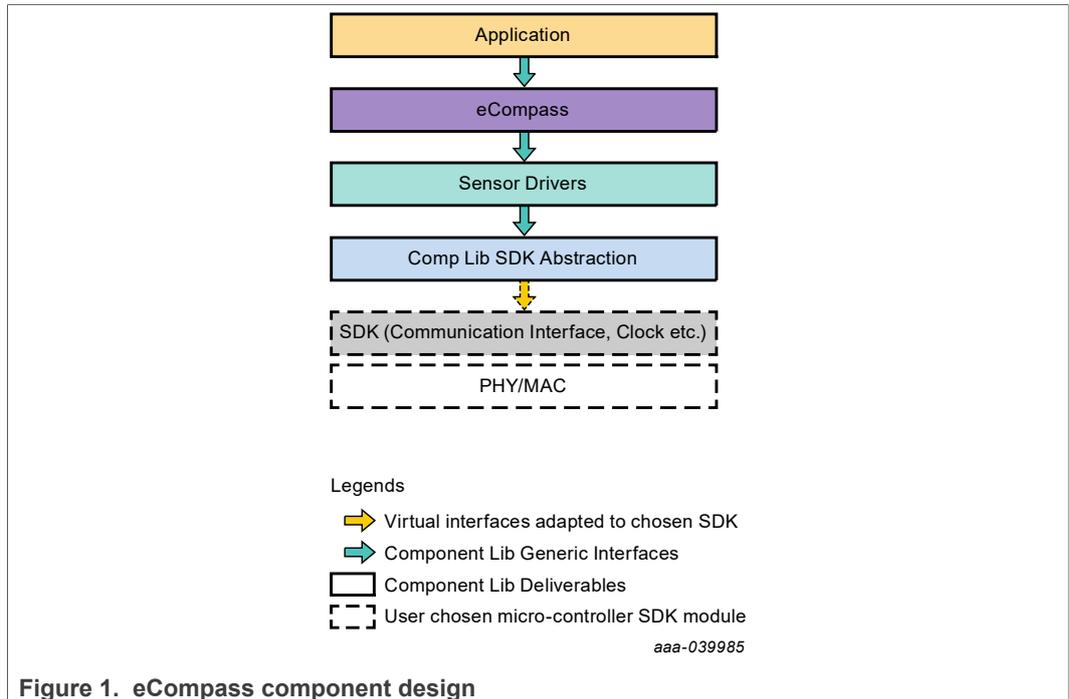
Figure 1. eCompass component design

3 eCompass component integration

The eCompass component is designed to be microcontroller agnostic. This section describes details about eCompass component directory structure and content overview. For more details about eCompass interfaces, refer to eCompass_API_Reference_Manual.

3.1 eCompass component directory structure

This section provides a snapshot of the basic eCompass component directory structure. The snapshot shows directory structure for the eCompass component:

```
ecompass/
|-- src
|   |-- ecompass.c
|   |-- ecompass.h
|-- example
|   |-- MCUXpresso
|   |   └── <project_name>
`-- docs
    |-- CompLib_eCompass_UG.docx
    |-- eCompass_API_Reference_Manual.zip
```

The eCompass component provides platform independent implementation. The end user is responsible for updating the communication interface to visualize output using SDK implementation for underlying microcontroller peripherals such as UART. NXP has limit tested the component for NXP microcontrollers FRDM-K64F (Cortex M4F core) integrating with MCUXpresso SDK. The reference example project for testing the eCompass component integration with MCUXpresso SDK is available under "example" folder.

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3.2 eCompass component content overview

This section provides a brief overview of the eCompass component source file contents and file descriptions:

```
eCompass/
|-- src¹
|   |-- eCompass.c²
|   |-- eCompass.h²
|-- example³
|   |-- MCUXpresso⁴
|   |      └── <project_name>⁵
`-- docs⁶
        |-- CompLib_eCompass_UG.docx⁷
        |-- eCompass_API_Reference_Manual.zip⁸
```

```
¹Folder containing eCompass component source files.
²Files containing eCompass implementations.
³Folder containing eCompass integration example with MCUXpresso SDK.
⁴Component libraries are provided with the NXP MCUXpresso SDK integration
 example application. The integration test example applications demonstrate
 how to integrate platform agnostic component libraries with underlying
 microcontroller SDK communication interfaces using virtual interface
 abstraction provided by component libraries.
⁵Folder containing eCompass integration example for with MCUX.
⁶Folder containing release documentation for eCompass component.
⁷eCompass Component User Guide.
⁸eCompass Component API RM.
```

Note: Before importing component library example projects for the standalone MCUXpresso IDE, the MCUXpresso IDE requires the corresponding microcontroller SDK package to be downloaded and installed on the IDE.

3.3 eCompass component testing

This section provides details on the eCompass component magnetic calibration method. Limit testing has been performed on this component using the provided integration example. When this example is executed, the eCompass component first calibrates the magnetometer for interference caused by ferromagnetic material in the vicinity of the magnetometer (hard iron compensation). For the eCompass component to successfully perform magnetometer calibration, the user must rotate the board along all 3-axes or twist the board in a figure 8 motion to ensure all 3-axes orientations are captured.

4 Revision history

Table 1. Revision history

Revision number	Date	Description
1	20210128	Initial release

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