# APPLICATION NOTE

# BCG REFERENCE DESIGN

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# 1 Introduction

## 1.1 Description

The purpose of this reference design is to help the integration of SCL3300 and BCGMCU into the final application. Though not intended to be used as is, it is a fully tested debugger and BCG performance validation tool.

## 1.2 Features

- SCL3300 inclinometer
- preprogrammed BCGMCU (EFM32PG1B100F256GM32 microcontroller)
- 5…9 V input voltage
- UART interfaces for data and FW upgrade
- 40 MHz crystal

## 1.3 Getting started

1. Connect voltage supply 5…9 V to Vin (J1). USB-UART bridge power wire can also be used as long as power supply is over 5V.
2. Connect the host e.g. UART-USB bridge (e.g. FTDI's TTL-232R-3V3-WE) to the 3.3V UART-interface pins SERIAL_RX and SERIAL_TX (J2).
   UART settings are below in Table 1.

**Table 1** Serial port configuration

| Parameter | |
|---|---|
| Baud rate | 230400 baud |
| Data bits | 8 |
| Parity | None |
| Stop bits | 1 |
| Flow control | None |

3. BCGMCU will start to send BCG-data at 1 Hz in binary format according to *Product Specification 6169 Rev.1 BCGMCU binary protocol specification ENG*

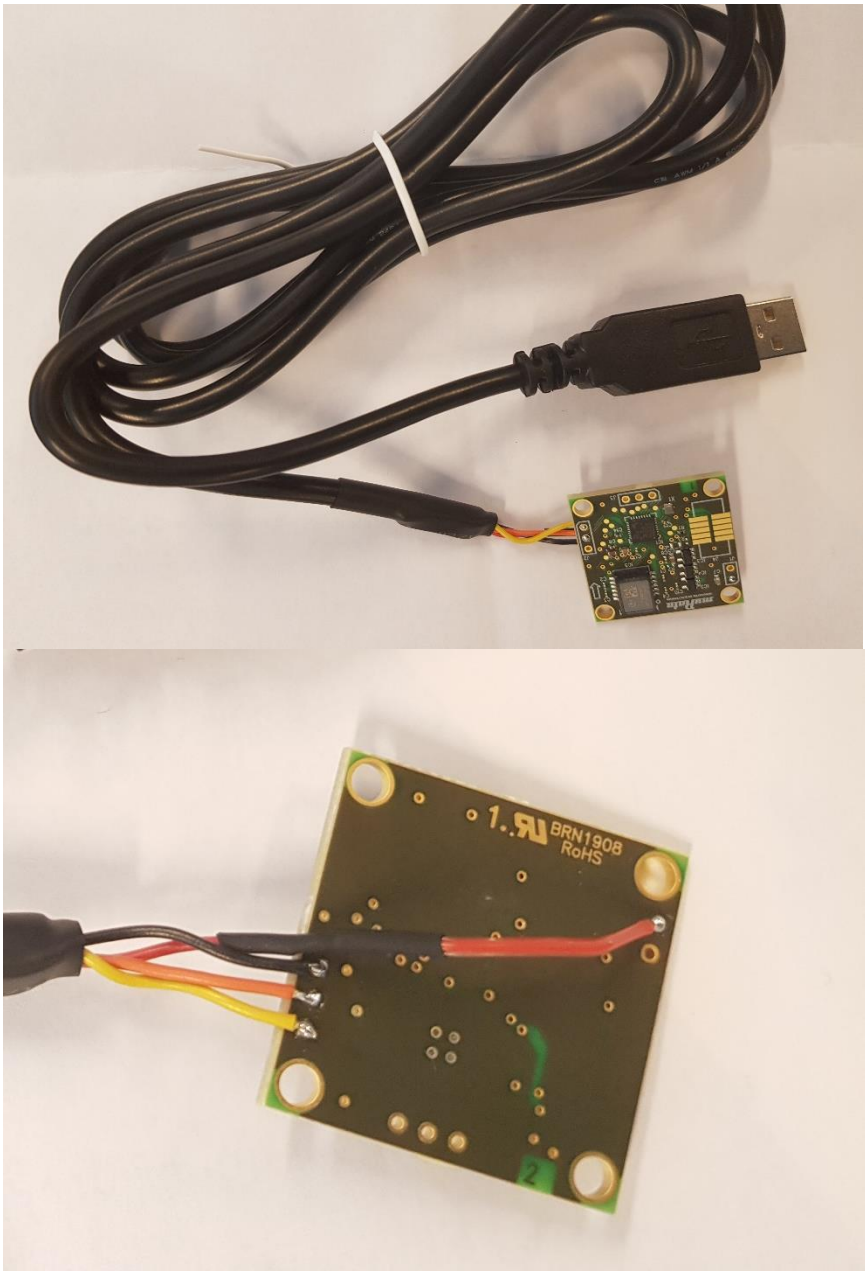



**Figure 1 FTDI USB-UART soldered on the reference design sample PCB**

## 2 Schematics

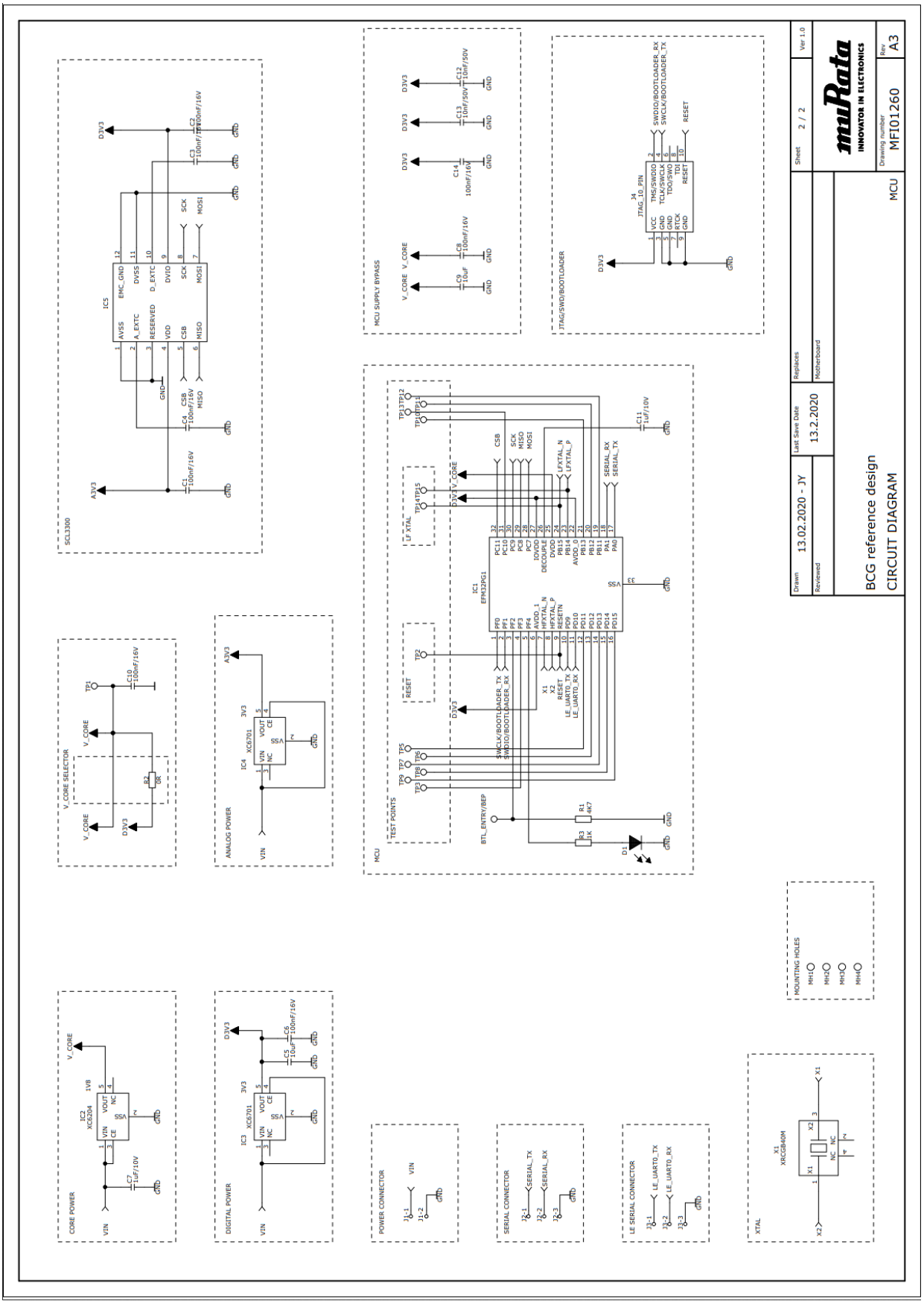



**Figure 2** Reference design schematic

## 3 Layout

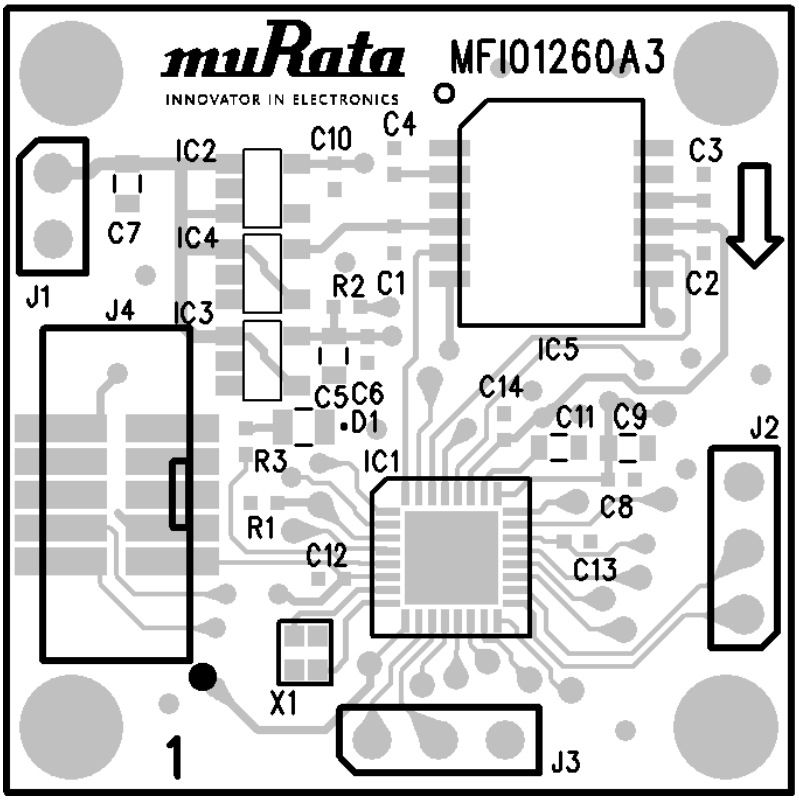


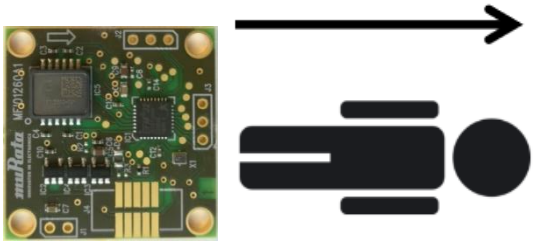

**Figure 3** Reference design layout

## 4 Bill of Materials

| Item | Qty | Reference | Description/Component value | Assembled | Manufacturer | Manufacturer type |
|---|---|---|---|---|---|---|
| 1 | 1 | IC5 | 3-axis inclinometer | X | Murata | SCL3300-D01 |
| 2 | 1 | IC1 | Pre-programmed BCGMCU | X | Silicon Labs | EFM32PG1B100FGM32-C0 |
| 3 | 1 | IC2 | IC REG LINEAR 1.8V 150MA SOT25 1.8 V | X | Torex | XC6204B182MR-G |
| 4 | 2 | IC3-4 | IC REG LINEAR 3.3V 150MA SOT25 3.3 V | X | Torex | XC6701B332MR-G |
| 5 | 2 | C12-13 | MLCC 10nF/50V | X | Murata | GCM155R71H103KA55D |
| 6 | 8 | C1-4,C6,C8,C10, C14 | MLCC 100nF/16V | X | Murata | GCM155R71C104KA55J |
| 7 | 2 | C5,C9 | MLCC 10uF/16V | X | Murata | GRM188C81C106MA73J |
| 8 | 2 | C7,C11 | MLCC 1uF/35V | X | Murata | GRT188C8YA105KE13D |
| 9 | 1 | R1 | SMD resistor 0402 4K7 | X | N/A | N/A |
| 10 | 1 | R2 | SMD resistor 0402 0R | | N/A | N/A |
| 11 | 1 | R3 | SMD resistor 0402 1K | | N/A | N/A |
| 12 | 1 | D1 | SMD LED 0805 Green | | N/A | N/A |
| 13 | 1 | J4 | CONNECTOR HEADER SMD 10POS 1.27MM | | Samtec | SHF-105-01-L-D-SM |
| 14 | 1 | X1 | CRYSTAL 40.0000MHZ 8PF SMD 40 MHz | X | Murata | XRCGB40M000F1S1BR0 |

## 5 Measurement direction

The Y-axis of the SCL3300 is used by the BCG algorithm, and the PCB should be attached so that the arrow direction points along the longitudinal axis of the person, towards the head of the user when the device is placed on a bed.



## 6 MCU pin layout and other information

The BCGMCU is a pre-programmed EFM32PG1B100F256GM32 microcontroller. The pin out descriptions etc. can be found from the EFM32PG datasheet here: https://www.silabs.com/documents/public/data-sheets/efm32pg1-datasheet.pdf

## 7 SW interface

Binary protocol over UART (SERIAL_RX/SERIAL_TX) according to *Product Specification 6169 Rev.1 BCGMCU binary protocol specification ENG*

Compatibility mode fulfills SCA10H BCG Sensor_3.0.0.0 firmware version and is described in *Product Specification 1327 SCA10H binary protocol specification.*

## 8 FW upgrade

FW can be upgraded on the MCU through bootloader UART (BOOTLOADER_RX/BOOTLOADER_TX/BTL_ENTRY) according to *Product Specification 5668 Rev.1 BCG-MCU FW upgrade specification ENG*.