SCMB100 User Manual

Summary

The SmartSense by Digi SCMB100 module is a low power 2.4GHz wireless transceiver module that combines an ARM processor, radio, RF PA/LNA, and a secure computing element.

Available with either a PCB trace antenna or external antenna connector, the module has been designed to be integrated into any device without the need for RF expertise. The SCMB100 enables one to add powerful wireless networking and private sensor network management to any product and quickly bring it to market.

Mechanical Drawing

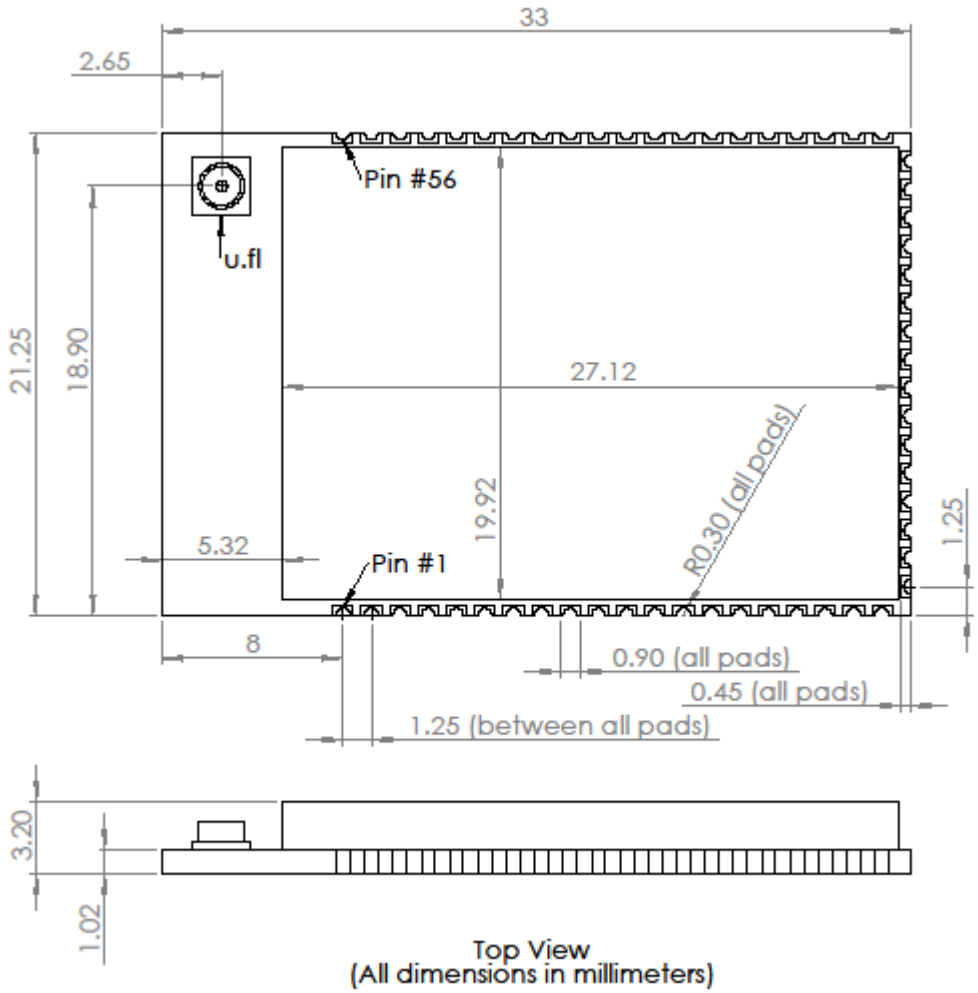

Figure 1: Mechanical dimensions

Recommended Footprint

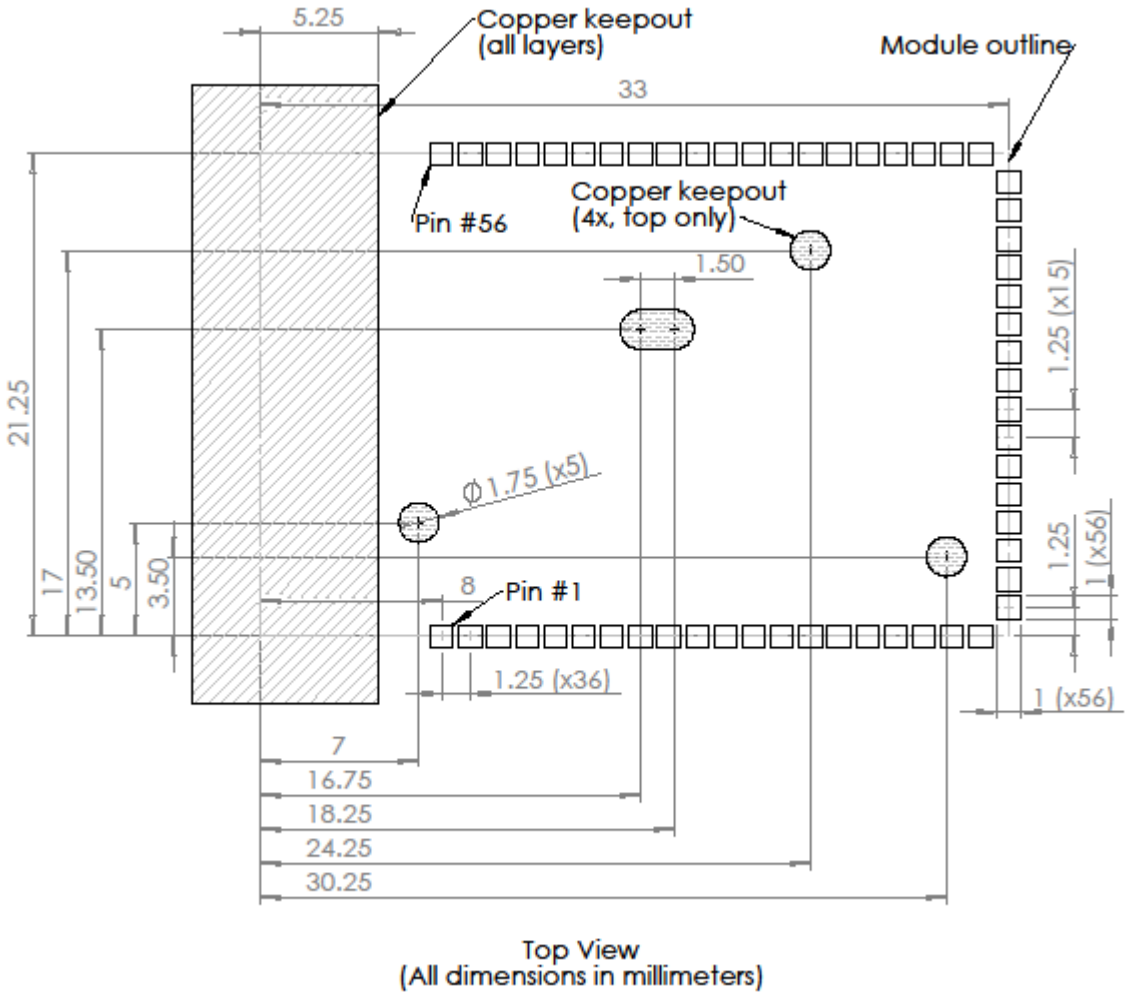

Figure 2: Recommended PCB layout

Test Points

There are five test points on the bottom of the module that can be used for programming the module before it is assembled into the user's end product.

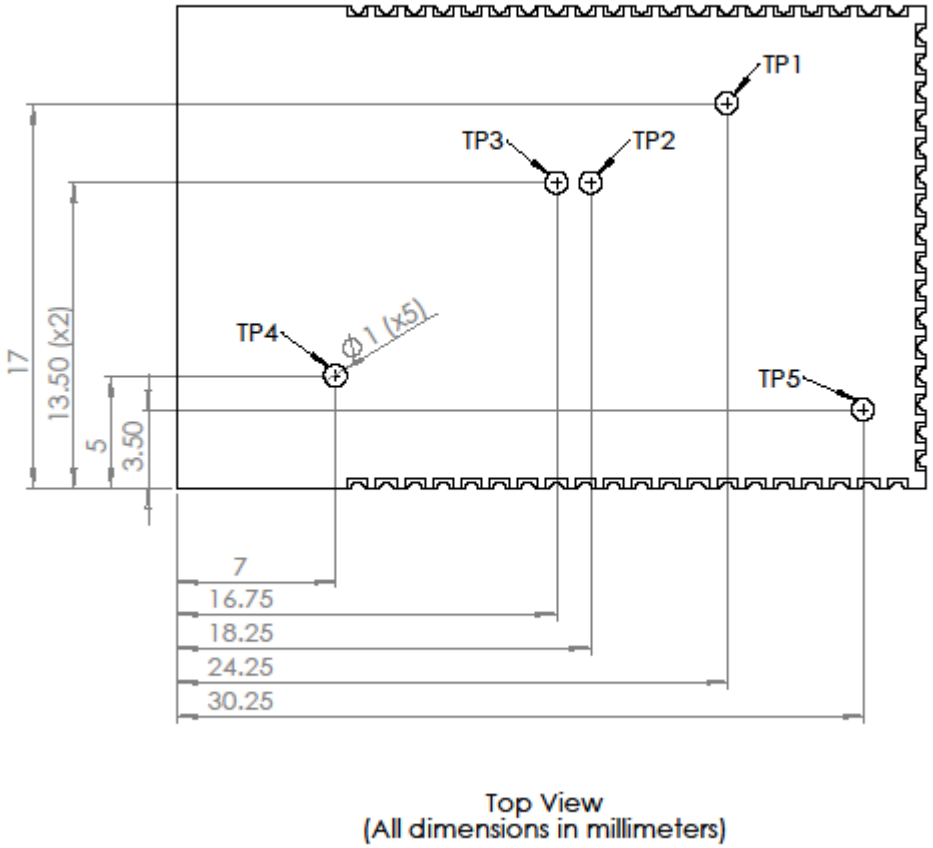

Figure 3: Test point locations

Pinout

Castellated Pads:

Castellated Pin No.	Name	Primary Type	Description
1	GND	Power	Ground
2	VSYS2	Power	Supply for RF power amplifier & low noise amplified
3	P0.10/NFC2	I/O	General purpose IO / NFC antenna connection
4	P0.09/NFC1	I/O	General purpose IO / NFC antenna connection
5	P0.23	I/O	General purpose IO
6	P0.22	I/O	General purpose IO
7	P0.21	I/O	General purpose IO
8	P1.10	I/O	General purpose IO
9	P1.11	I/O	General purpose IO
10	P1.12	I/O	General purpose IO
11	P1.13	I/O	General purpose IO
12	P1.14	I/O	General purpose IO
13	P1.16	I/O	General purpose IO

14	P0.03/AIN1	I/O	General purpose IO / Analog input
15	P0.02/AIN0	I/O	General purpose IO / Analog input
16	P0.28/AIN4	I/O	General purpose IO / Analog input
17	P0.29/AIN5	I/O	General purpose IO / Analog input
18	VSYS1	Power	Supply for processor & secure computing element
19	GND	Power	Ground
20	P0.30/AIN6	I/O	General purpose IO / Analog input
21	P0.31/AIN7	I/O	General purpose IO
22	P1.08	I/O	General purpose IO
23	P0.04/AIN2	I/O	General purpose IO
24	P0.26	I/O	General purpose IO
25	P0.05/AIN3	I/O	General purpose IO
26	P0.27	I/O	General purpose IO
27	P0.06	I/O	General purpose IO
28	P0.08	I/O	General purpose IO
29	P0.19	I/O	General purpose IO
30	P0.18/RESET	I/O	General purpose IO / Active low hardware reset
31	P0.20	I/O	General purpose IO
32	P0.16	I/O	General purpose IO
33	P0.17	I/O	General purpose IO
34	P0.07/TRACECLK	I/O	General purpose IO / JTAG TRACECLK
35	P1.09/TRACEDATA3	I/O	General purpose IO / JTAG TRACEDATA[3]
36	P0.11/TRACEDATA2	I/O	General purpose IO / JTAG TRACEDATA[2]
37	P0.12/TRACEDATA1	I/O	General purpose IO / JTAG TRACEDATA[1]
38	P1.00/SWO/TRACEDATA0	I/O	General purpose IO / JTAG SWO / JTAG TRACEDATA[0]
39	VBUS	Power	USB supply voltage
40	DN	USB	USB D- Line
41	DP	USB	USB D+ Line
42	GND	Power	Ground
43	P0.13	I/O	General purpose IO
44	P0.14	I/O	General purpose IO
45	P0.15	I/O	General purpose IO
46	GND	Power	Ground
47	SWDIO	Programming	Serial wire debug data
48	SWDCLK	Programming	Serial wire debug clock
49	P0.25/SDA	TWI	Two-wire interface data
50	P0.24/SCL	TWI	Two-wire interface clock
51	P1.01	I/O	General purpose IO
52	P1.02	I/O	General purpose IO
53	P1.04	I/O	General purpose IO
54	P1.03	I/O	General purpose IO
55	GND	Power	Ground
56	GND	Power	Ground

Bottom Test Points:

Bottom Test Point	Name	Type	Description
TP1	P0.18/RESET	Reset	Active low hardware reset
TP2	SWDIO	Programming	Serial wire debug data
TP3	SWDCLK	Programming	Serial wire debug clock
TP4	GND	Power	Ground
TP5	VSYS1	Power	Supply for processor & secure computing element

Electrical Characteristics

Recommended Operation Conditions:

Description	Symbol	Min.	Nom.	Max.	Units	Notes
Supply Voltage 1	VSYS1	1.8	3.3	3.6	V	
Supply Voltage 2	VSYS2	1.8	3.3	3.6	V	To minimize current consumption, VSYS2 should match VSYS1
USB Voltage	VSUB	4.35	5	5.5	V	Not required for operation
Operating Temperature	T_A	-40	+25	+85	°C	

Hardware Variants

The SCMB100 is available in two variants:

- SCMB100-T – Configured to use the on-board inverted-F trace antenna
- SCMB100-E – Configured to use an external antenna attached via the u.fl connector

Radio Operation

The SCMB100 module has been certified using the GFSK modulation scheme employed by Bluetooth Low Energy devices. The transmitter may use both 1Mbit/s and 2Mbit/s modulation rates. The transmitter is not subject to any duty cycle restrictions. The output power from the transmitter must be limited (via software) to -4dBm to remain in compliance with FCC and IC regulations. The RF power amplifier may be enabled or disabled based on the user's application.

This device is approved to work with either 1) the on-board inverted-F PCB trace antenna or, 2) an external isolated magnet dipole antenna having a maximum gain of 2.5dBi.

Regulator Notices

Changes or modifications could void the user's authority to operate the equipment.

Federal Communications Commission

The SCMB100 module complies with Part 15 of the FCC rules and regulations. Compliance with the labeling requirements, FCC notices and antenna usage guidelines is required. To fulfill FCC Certification, the OEM must comply with the following regulations:

1. The system integrator must ensure that the text detailed in OEM labeling requirements is placed on the outside of the final product.
2. This device may only be used with antennas that have been tested and approved for use with the module.

OEM labeling requirements

WARNING! As an Original Equipment Manufacturer (OEM) you must ensure that FCC labeling requirements are met. You must include a clearly visible label on the outside of the final product enclosure that displays the following content:

Contains FCC ID: 2ATZ3-SCMB100

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1.) this device may not cause harmful interference and (2.) this device must accept any interference received, including interference that may cause undesired operation.

FCC notices

IMPORTANT: This module been certified by the FCC for use with other products without any further certification (as per FCC section 2.1091). Modifications not expressly approved by SmartSense by Digi could void the user's authority to operate the equipment.

IMPORTANT: OEMs must test final product to comply with unintentional radiators (FCC section 15.107 & 15.109) before declaring compliance of their final product to Part 15 of the FCC Rules.

IMPORTANT: This module has been certified for remote and base radio applications. If the module will be used for portable applications, the device must undergo SAR testing. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: Re-orient or relocate the receiving antenna, Increase the separation between the equipment and receiver, Connect equipment and receiver to outlets on different circuits, or Consult the dealer or an experienced radio/TV technician for help.

FCC approved antennas

This module can be installed using antennas and cables constructed with non-standard connectors (RPSMA, RPTNC, etc.) An adapter cable may be necessary to attach the module connector to the antenna connector.

The modules are FCC approved for fixed base station and mobile applications for the channels indicated in the tables below. If the antenna is mounted at least 20 cm (7.87 in) from nearby persons, the application is considered a mobile application. Antennas not listed in the table must be tested to comply with FCC Section 15.203 (Unique Antenna Connectors) and Section 15.247 (Emissions).

The antennas listed below have been approved for use with this module:

- on-board inverted-F PCB trace antenna
- external isolated magnet dipole antenna having a maximum gain of 2.5dBi

Contact SmartSense by Digi for additional details regarding applicable antennas.

> If using the RF module in a portable application (for example, if the module is used in a handheld device and the antenna is less than 20 cm from the human body when the device is in operation), The integrator is responsible for passing additional Specific Absorption Rate (SAR) testing based on FCC rules 2.1091 and FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields, OET Bulletin and Supplement C. The testing results will be submitted to the FCC for approval prior to selling the integrated unit. The required SAR testing measures emissions from the module and how they affect the person.

RF exposure

If you are an integrating the SCMB100 into another product, you must include the following Caution statement in OEM product manuals to alert users of FCC RF exposure compliance:

CAUTION! To satisfy FCC RF exposure requirements for mobile transmitting devices, a separation distance of 20 cm or more must be maintained between the antenna of this device and persons during device operation. To ensure compliance, operations at closer than this distance are prohibited. The antenna used for this transmitter must not be colocated in conjunction with any other antenna or transmitter except the colocation(s) as allowed by the Grant Conditions of this module (FCC ID: 2ATZ3-SCMB100).

FCC publication 996369 related information

In Publication 996369 section D03, the FCC requires information concerning a module to be presented by OEM manufacturers. This section assists in answering or fulfilling these requirements.

2.1 General

No requirements are associated with this section.

2.2 List of applicable FCC rules

This module conforms to FCC Part 15.247.

2.3 Summarize the specific operational use conditions

Certain approved antennas require attenuation for operation. Host product user guides must include the antenna table if end customers are permitted to select antennas.

2.4 Limited module procedures

Not applicable.

2.5 Trace antenna designs

While it is possible to build a trace antenna into the host PCB, this requires at least a Class II permissive change to the FCC grant which includes significant extra testing and cost. If an embedded trace antenna is desired, simply select the SCMB100 module variant with the preferred antenna.

2.6 RF exposure considerations

For RF exposure considerations see RF exposure and FCC-approved antennas (2.4 GHz). Host product manufacturers need to provide end-users a copy of the “RF Exposure” section of the manual: RF exposure.

2.7 Antennas

A list of approved antennas is provided.

2.8 Label and compliance information

Host product manufacturers need to follow the sticker guidelines outlined in OEM labeling requirements.

2.9 Information on test modes and additional testing requirements

Contact a SmartSense sales representative for information on how to configure test modes for the SCMB100 product.

2.10 Additional testing, Part 15 Subpart B disclaimer

All final host products must be tested to be compliant to FCC Part 15 Subpart B standards. While the SCMB100 unit was tested to be compliant to FCC unintentional radiator standards, FCC Part 15 Subpart B compliance testing is still required for the final host product. This testing is required for all end products, and SCMB100 Part 15 Subpart B compliance does not affirm the end product’s compliance. See FCC notices for more details.

ISED (Innovation, Science and Economic Development Canada)

Labeling requirements

The integrator is responsible for its product to comply with IC ICES-003 & FCC Part 15, Sub. B - Unintentional Radiators. ICES-003 is the same as FCC Part 15 Sub. B and Industry Canada accepts FCC test report or CISPR 22 test report for compliance with ICES-003.

Labeling requirements for Industry Canada are similar to those of the FCC. A clearly visible label on the outside of the final product enclosure must display the following text.

Contains IC: 25306-SCMB100

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device. Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

RF Exposure

CAUTION! This equipment is approved for mobile and base station transmitting devices only. Antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be colocated or operating in conjunction with any other antenna or transmitter except the collocation(s) as allowed by the Grant Conditions of this module (IC: 25306-SCMB100).

ATTENTION! Cet équipement est approuvé seulement pour l'utilisation avec la base ou en mobile. L'antenne(s) utilisée pour cet émetteur doit être installée pour être à une distance minimum d'au moins 20 cm de toutes personnes et ne doit pas être situé à proximité ou fonctionné en conjonction avec tout autre antenne ou émetteur, à l'exception d'une utilisation en conjonction avec des modules qui suivent ces conditions spécifiques (IC: 25306-SCMB100).

This radio transmitter (IC: 25306-SCMB100) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

- on-board inverted-F PCB trace antenna
- external isolated magnet dipole antenna having a maximum gain of 2.5dBi

Detachable Antenna

Under Industry Canada regulations, this radio transmitter may operate using only an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential

radio interference to other users, the antenna type and its gain must be so chosen that the equivalent isotropically radiated power (EIRP) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peutfonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvépour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillageradioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne etson gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépassepas l'intensité nécessaire àl'établissement d'une communication satisfaisante.

Revision History

Revision	Date	Author	Description
1.0	8/29/2019	kwg	• Created initial revision
1.1	1/7/2020	kwg	• Updated verbiage in FCC RF Exposure section
1.2	1/9/2020	Kwg	• Updated FCC and IC statements (including French statement) to allow colocation as allowed by the grant conditions.