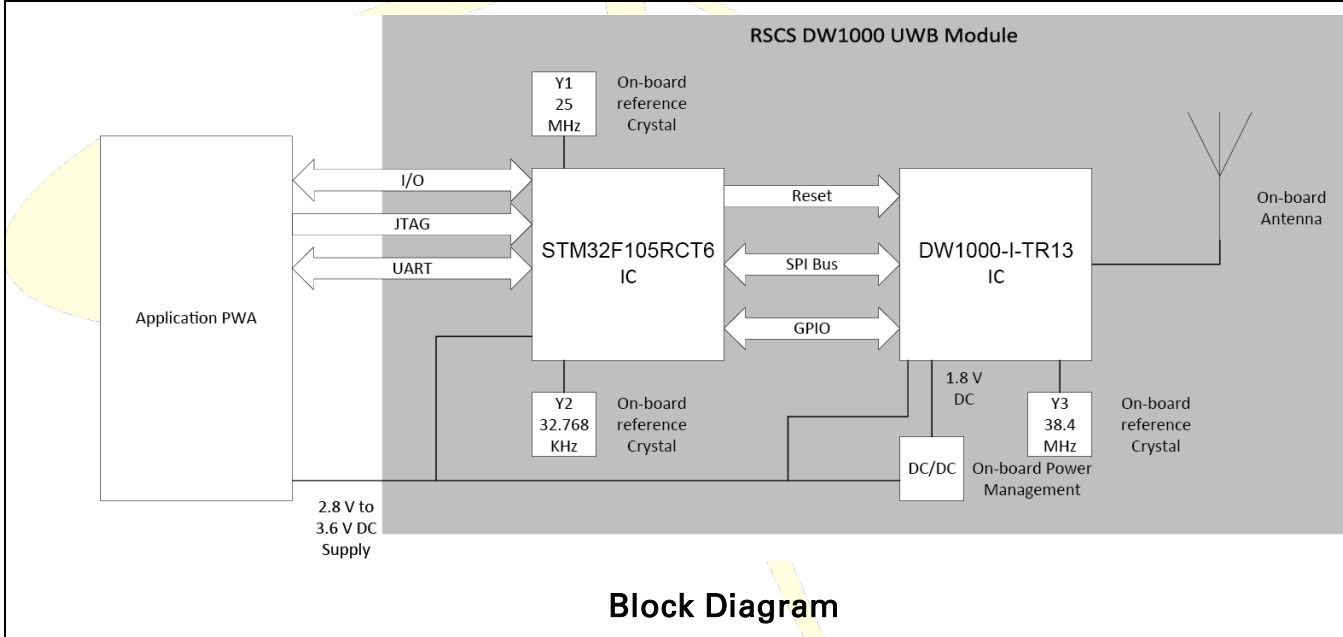


Product Overview

The RSCS DW1000 UWB Module is based on Decawave's DW1000 Ultra-Wideband (UWB) transceiver IC and the ST Micro STM32F105 ARM processor. It contains all the hardware required to implement Ultra-Wideband communications (Two-Way Ranging and TDOA location systems) as a single shielded unit. It integrates antenna, all RF circuitry, power management, and clock circuitry for the RF components as well as an ARM processor used to run the Ultra-Wideband application being employed.

Key Features

- IEEE 802.15.4-2011 UWB Compliant
- Supports the 6489.6 MHz center frequency (UWB Channel 5) with a bandwidth of 499.2 MHz
- Fixed Transmitter Output Power
- Complies with FCC, ETSI, and IC spectral masks
- Supply voltage of 2.8 V to 3.6 V
- Low power consumption
- Fixed Data rate of 6.8 Mbps
- Supports 2-way ranging and TDOA
- Multiple Interfaces to main application processor
- 2.03" x 1.20" x 0.14" 27 pin side castellation package



Overview

The RSCS DW1000 UWB Module is an IEEE 802.15.4-2011 UWB implementation. It is comprised of the Decwave DW1000 UWB transceiver and supporting RF components as well as an ST Micro STM32F105 ARM processor which controls the transceiver behavior. The RSCS DW1000 USB Module enables RSCS, Inc. to incorporate UWB communications and ranging features into a greater variety of products in an accelerated and more cost effective way.

Functional Description

The IEEE 802.15.4-2011 UWB compliant transceiver inside the DW1000 is capable of generating and receiving signals on any of six RF bands from 3.5 GHz to 6.5 GHz. However, it is regulated to the 6489.6 MHz center frequency and 499.2 MHz bandwidth by the Control Interface firmware, for use by the application for communication and distance measurement purposes. The DW1000 generates/receives a differential signal (RF_P and RF_N). This is converted to/from single ended by a balun. It is in that form that it connects to the permanently affixed, FCC 15.203 compliant, antenna.

The DW1000 is controlled by the STM32F105 via the SPI interface. This consists of the traditional SPI signals (CLK, CSn, MOSI, MISO) plus reset (RSTn) and interrupt (IRQ).

Host Interface

The STM32F105 has two main communication paths to the application Printed Wiring Assembly (PWA). These are by USART (USART3_TX, USART3_RX) and USB (PA12_DP, PA11_DM). Other available pins include RSTL (which connects directly to the STM32F105 reset pin).

Programming Interface

There are two means of programming the STM32F105. The basic method is by using the JTAG interface. The traditional JTAG signals (PA15_JTDI, PA14_JTCK, PA13_JTMS, PB3_JTDO, PB4_JTRST) as well as the USB lines are available for use.

EEPROM Interface

The application PWA shall have a serial EEPROM. Module pin PB8 (Output) is the clock, and PB9 (BiDir) is the data. One example of such an EEPROM is the STMicroelectronics M24C64-RMN6TP.

General Purpose Input Output (GPIO)

Most of the other pins have dedicated purposes.

- a. ARM_PB7 (input) is sampled after RSTL is negated to select module behavior. If low, the module shall be an "anchor"; if high, it shall be a tag.
- b. ARM_PC12_CK (output) indicates, when high, that the module is transmitting.
- c. ARM_RESET_CC (output) indicates, when low, that the DW1000 in the module is being reset.
The application board must not drive this signal. If this signal is driven by the ranging board, the module will not function properly.

The other GPIO pins (ARM_PB5_IO, ARM_PB6_IO) are unused.

Pin Connections

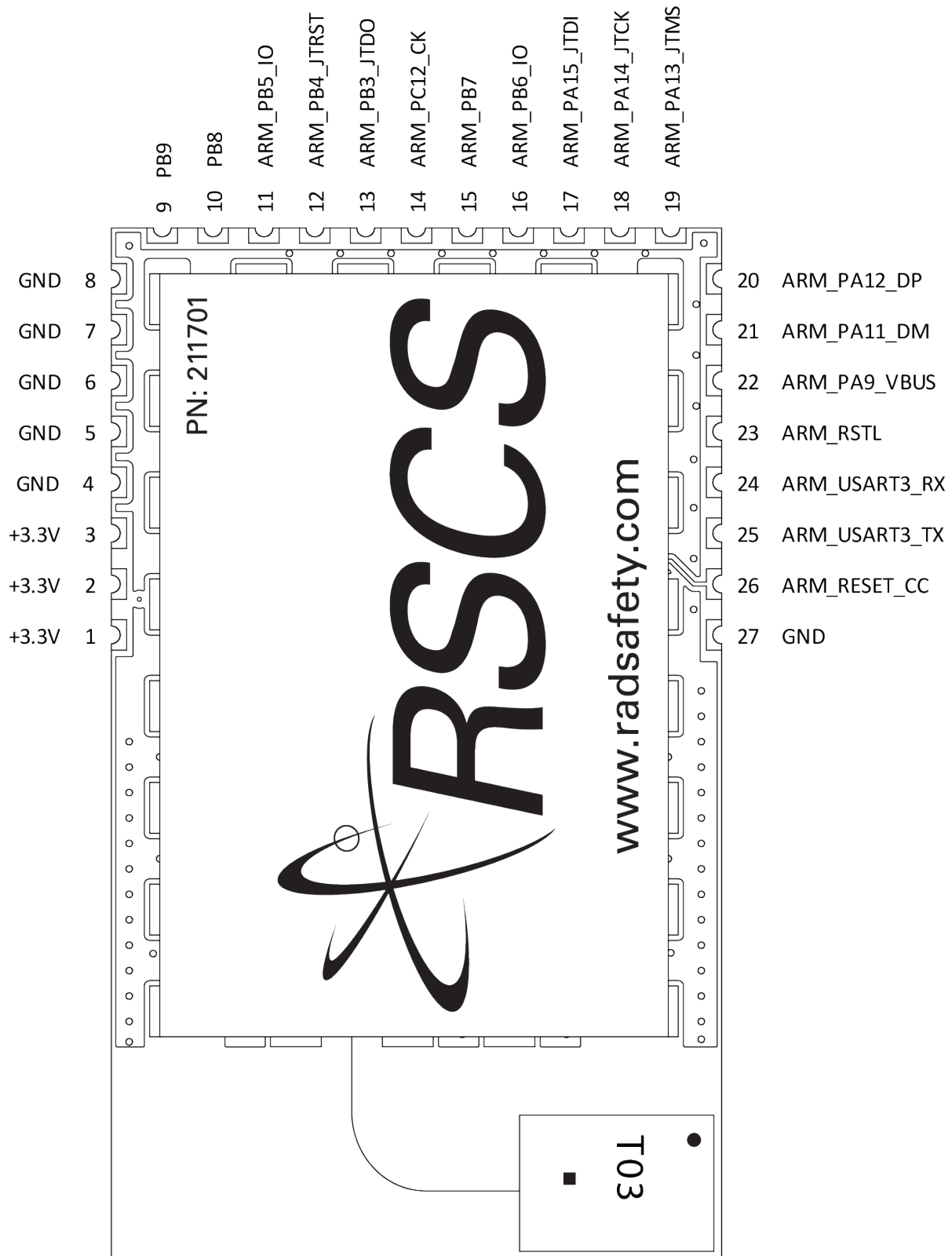


Figure 1 RSCS DW1000 USB Module Pin Out

Pin Descriptions

Signal Name	Pin	I/O Default	Description
+3.3V	1		
+3.3V	2		
+3.3V	3		
GND	4		
GND	5		
GND	6		
GND	7		
GND	8		
PB9	9	I/O	Data for Serial EEPROM
PB8	10	Out	Clock for Serial EEPROM
ARM_PB5_IO	11	In (unused)	
ARM_PB4_JTRST	12	In	
ARM_PB3_JTDO	13	Out	
ARM_PC12_CK	14	Out	Module is transmitting (active high)
ARM_PB7	15	In	Low for "anchor"; High for "tag"
ARM_PB6_IO	16	In (unused)	
ARM_PA15_JTDI	17	In	
ARM_PA14_JTCK	18	In	
ARM_PA13_JTMS	19	In	
ARM_PA12_DP	20	I/O	
ARM_PA11_DM	21	I/O	
ARM_PA9_VBUS	22	USB power in	
ARM_RSTL	23	In	Module reset (active low)
ARM_USART3_RX	24	In	USART into module
ARM_USART3_TX	25	Out	USART out from module
ARM_RESET_CC	26	Out	Module is resetting DW1000 (active low)
GND	27		

Electrical Specifications

Parameter	Min.	Typ.	Max.	Units	Condition/Note
Operating Temperature	-20		+70	°C	
Supply Voltage	2.8	3.3	3.6	V	Normal Operation

Application Information

Application Board Layout Guidelines

When designing the PCB onto which the RSCS DW1000 UWB Module will be soldered, the proximity of the Module on-board ceramic monopole antenna to metal and other non-RF transparent materials needs to be considered carefully. Two suggested placement schemes are shown below.

For best RF performance, ground copper should be flooded in all areas of the application board, except in the areas marked "Keep-Out Area", where there should be no metal either side, above or below (e.g. do not place battery under antenna).

The placement schemes in Figure 2 show an application board with no non-RF transparent material Keep-Out area, or an application board with the antenna projecting off of the board so that the keep out area is in free-space. In this second scheme it is still important not to place metal components above or

below the antenna in a system implementation. It is also important to note that the ground plane on the application board affects the Module antenna radiation pattern. In Figure 2 below the distance of the Keep-Out area must be a minimum of 10 mm.

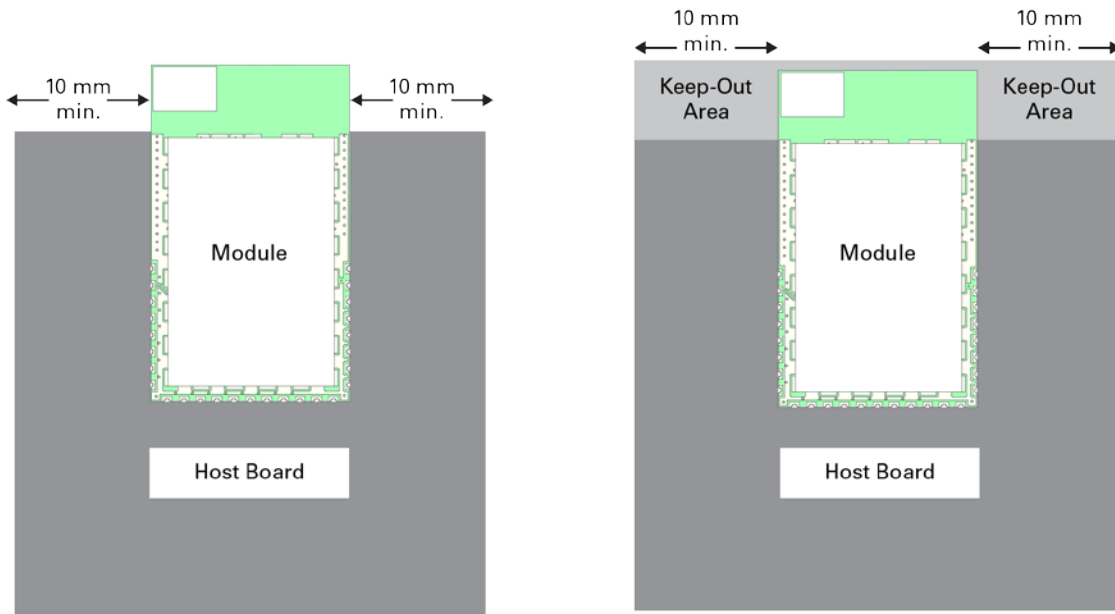


Figure 2 Application Board Keep-Out Areas

Application Circuit Diagram

A simple application circuit integrating the RSCS DW1000 UWB Module need only power the device and connect the device to a host controller, see Figure 3.

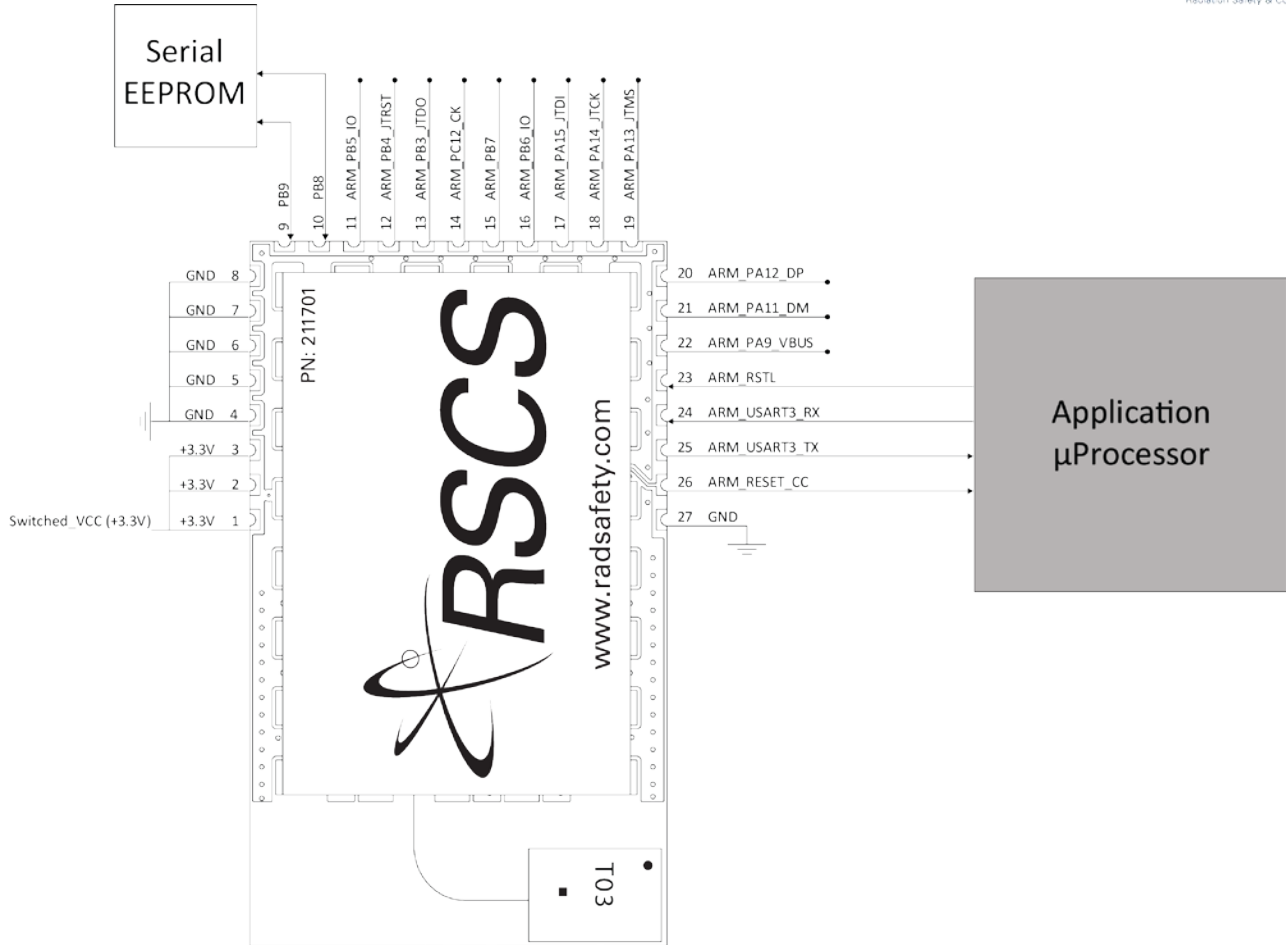


Figure 3 Example Application Circuit

Package Information

Module Drawings

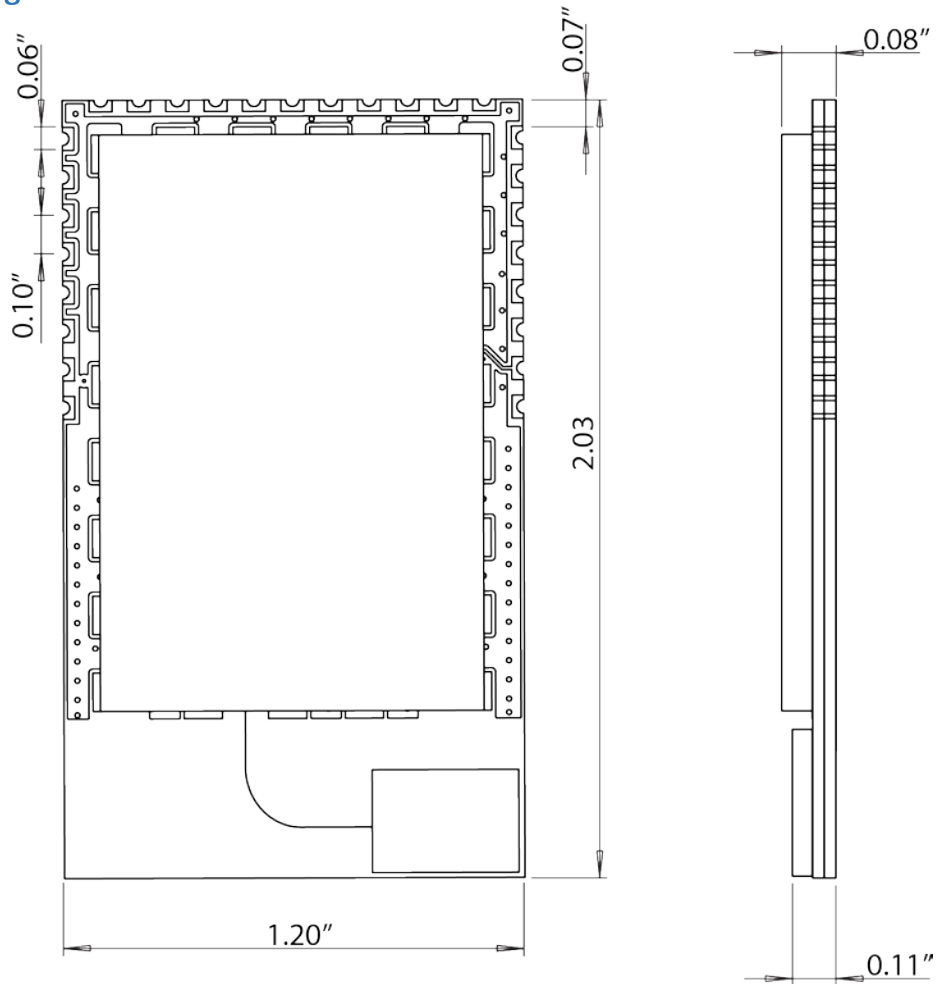


Figure 4 RSCS DW1000 UWB Module Dimensions

Agency Certifications

United States (FCC)

This device complies with Part 15 of the FCC Rules:

Operation is subject to the following 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

Changes and Modifications not expressly approved by Radiation Safety & Control Services, Inc. can void your authority to operate this equipment under Federal Communications Commission rules.

Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

To fulfill FCC Certification requirements, an OEM manufacturer must comply with the following regulations:

1. The RSCS DW1000 UWB modular transmitter must be labeled with its own FCC ID number, and, if the FCC ID is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following:

IMPORTANT: Contains FCC ID: 2ADY2RSCSDWUWBM1. This equipment 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 15.19).

European Union (ETSI)

The RSCS DW1000 UWB Module has been certified for use in European Union countries. If these modules are incorporated into a product, the manufacturer must ensure compliance of the final product to be European harmonized EMC and low voltage/safety standards. A declaration of Conformity must be issued for each of these standards and kept on file as described in Annex II of the R&TTE Directive.

Furthermore, the manufacturer must maintain a copy of the modules' documentation and ensure the final product does not exceed the specified power ratings, antenna specifications, and/or installation requirements as specified in the user manual. If any of these specifications are exceeded in the final product, a submission must be made to a notified body for compliance testing to all required standards.

IMPORTANT: The "CE" marking must be affixed to a visible location on the OEM product. The CE mark shall consist of the initials "CE" taking the following form:

The CE marking must have a height of at least 5mm except where this is not possible on account of the nature of the apparatus.

The CE marking must be affixed visibly, legibly, and indelibly.

Industry Canada (IC) Compliance Statements

This device complies with Industry Canada licence-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.

CAUTION: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

The OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

This Module is labelled with its own IC ID. If the IC ID Certification Number is not visible while installed inside another device, then the device should display the label on it referring the enclosed module. In that case, the final end product must be labelled in a visible area with the following:

"Contains Transmitter Module IC: 12574A-RSCSDWUWBM1"

OR

"Contains IC: 12574A-RSCSDWUWBM1"

Ce module est étiqueté avec son propre ID IC. Si le numéro de certification IC ID n'est pas visible lorsqu'il est installé à l'intérieur d'un autre appareil, l'appareil doit afficher l'étiquette sur le module de référence ci-joint. Dans ce cas, le produit final doit être étiqueté dans un endroit visible par le texte suivant:

"Contains Transmitter Module IC: 12574A-RSCSDWUWBM1"

OR

"Contains IC: 12574A-RSCSDWUWBM1"

Document History

Document Rev.	Date	Comments
Revision 1	4/1/2016	Initial Draft