



Serie User Manual

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1. Introduction

1.1. SCOPE

This manual defines the interface that should be met by a host, in order to operate with the SERIE module.

The SERIE is designed to be connected to a host (no stand alone). It can be easily integrated into other device without the need for RF experience and expertise.

The SERIE operates in the 2.4-2.4835 GHz unlicensed worldwide ISM band.

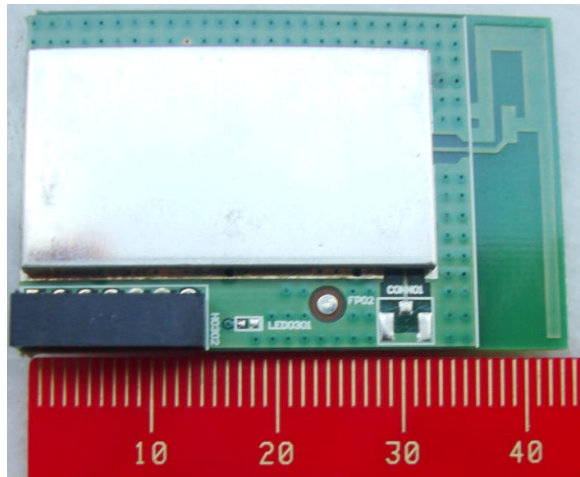


Figure 1: SERIE module

1.2. Definitions, Acronyms, and Abbreviations

This section contains descriptions of terms, acronyms, and abbreviations that are used throughout this document.



Caution !
ESD sensitive device.
Precaution should be used when handling the device in order to prevent permanent damage

2. Hardware interface

2.1. Connector

The SERIE module uses a 7 pin 1 row 2mm pitch female connector.

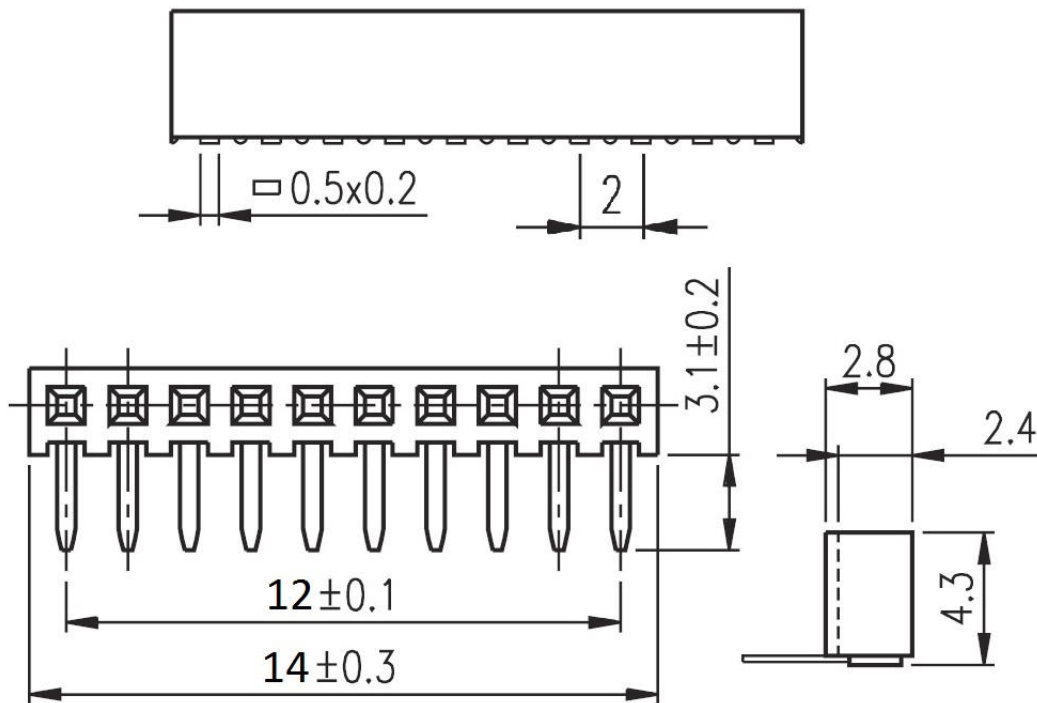


Figure 2: SERIE module female connector dimensions (mm)

The host must use a 7 pin 1 row 2mm pitch male connector.

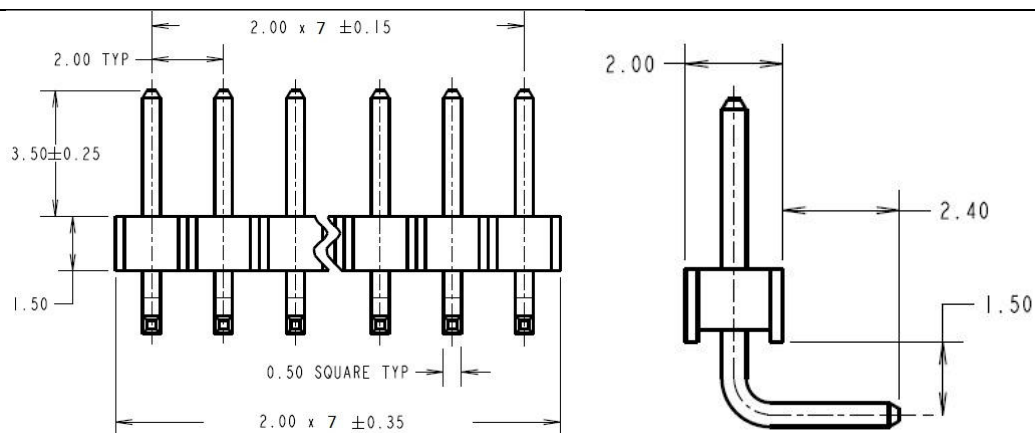


Figure 3: Host male connector dimensions (mm)

2.2. PCB dimensions

SERIE module dimensions are 44x28x4 mm (LxWxH)

The space under the antenna (28x9mm) should be left free in order not to reduce the antenna performance. If there is PCB (with or without grounding plane) or other material under the antenna area, antenna will be tuned from its resonant frequency impedance and re-matching is needed.

The space under the module (except the area defined before) can be free of board or not but if the host occupy this area, connector height must be considered.

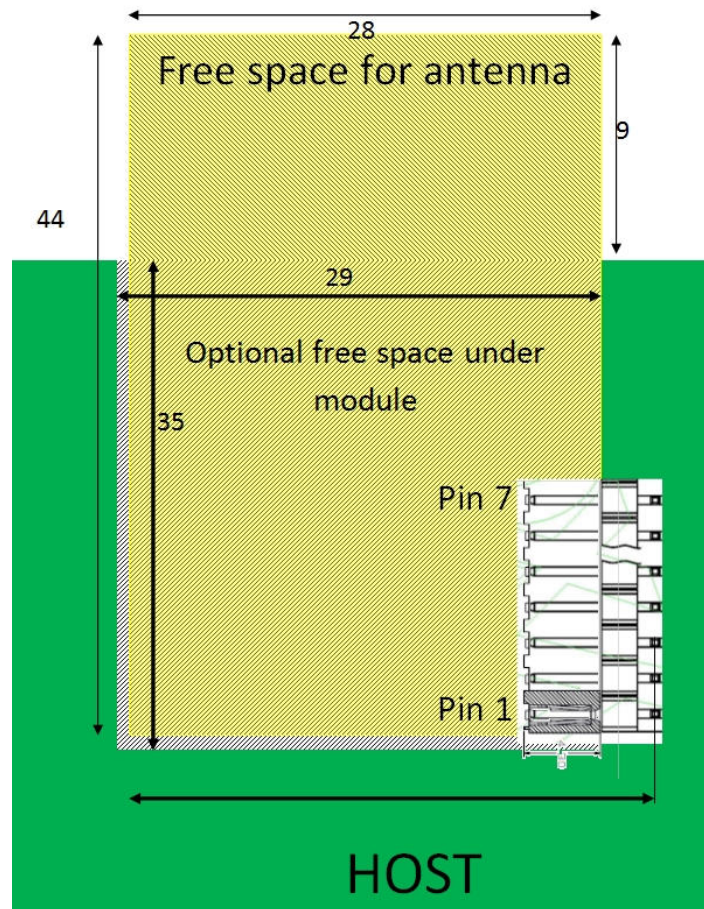
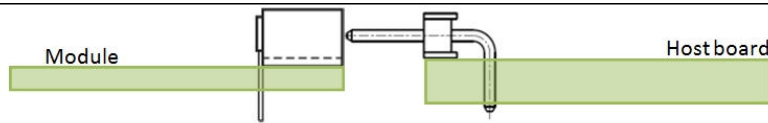


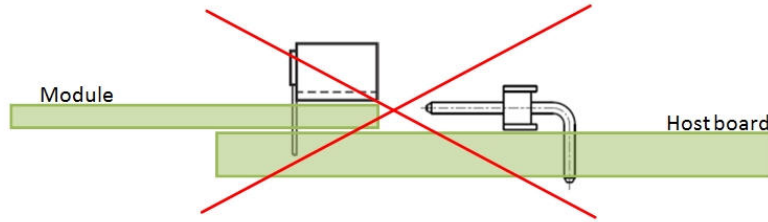
Figure 4: SERIE module over a host

If the Host has PCB under the SERIE module, you should take care about the height of the connectors.

No host pcb
under module



Wrong host
under module



Right host
under module

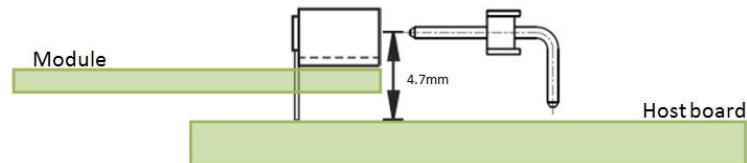


Figure 5: Connection detail

2.3. PIN Assignment

The pin-out of the connector is shown in the next table.

Pin number	Description
1	UART_RTS/GPIO1
2	UART_CTS/GPIO2
3	UART_TX
4	UART_RX
5	GND
6	GND
7	VCC_3V3

Table 1: Pinout description

3. Protocol interface

The SERIE module implements TI's Z-Stack, a fully compliant ZigBee 2012 solution. The firmware is based on CC2530 Zigbee-PRO Network Processor sample application.

3.1. UART Transport

3.1.1. Configuration

The following UART configuration is supported:

- Baud rate: 115200
- Hardware (RTS/CTS) flow control.
- 8-N-1 byte format.

3.1.2. Frame Format

UART transport frame format is shown in the following figure. The left-most field is transmitted first over the wire.

Bytes: 1	3-253	1
SOF	General format frame	FCS

Figure 6: UART Transport Frame Format

SOF: Start of frame indicator. This is always set to 0xFE.

General frame format: This is the general frame format as described in 2.4.

FCS: Frame-check sequence. This field is computed as an XOR of all the bytes in the general format frame fields.

Shown below is a C example for the FCS calculation:

```
unsigned char calcFCS (unsigned char *pMsg, unsigned char len)
{
    unsigned char result = 0;
    while (len--)
    {
        result ^= *pMsg++;
    }
    return result;
}
```

3.1.3. Signal Description

The following standard UART signals are used:

- TX: Transmit data.
- RX: Receive data.
- CT: Clear to send. (optional)
- RT: Ready send. (optional)

Figure 7 shows the RTS/CTS flow control connections to the host processor. On the SERIE, RT and CT are active-low signals. The RT output is driven low when the receive register is empty and reception is enabled. Transmission of a byte does not occur before the CT input goes low.

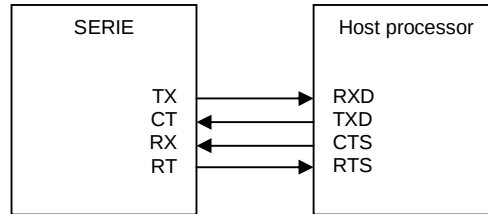


Figure 7: RTS/CTS Flow Control Connections

3.1.4. Signal Operation

UART transport sends and receives data asynchronously. Data can be sent and received simultaneously and the transfer of a frame can be initiated at any time by either the application processor or the SERIE.

3.2. General Frame Format

The general frame format is shown in the following figure. The left-most field is transmitted first over the wire. For multi-byte fields, the lowest order byte is transmitted first.

Bytes:	2	0-250
1		
Length	Command	data

Figure 8: General Frame Format

Length: The length of the data field of the frame. The length can range from 0-250.

Command: The command of the frame.

Data: The frame data. This depends on the command field.

3.2.1. Command Field

The command field is constructed of two bytes. The bytes are formatted as shown in the following figure. The Cmd0 byte is transmitted first.

Cmd0		Cmd1	
Bits:	4-0	7-0	
7-5			
Type	Subsystem	ID	

Figure 9: Command field

Type: The command type has one of the following values:

- 0: POLL. A POLL command is used to retrieve queued data. This command is only applicable to SPI transport. For a POLL command the subsystem and ID are set to zero and data length is zero.
- 1: SREQ: A synchronous request that requires an immediate response. For example, a function call with a return value would use an SREQ command.

- 2: AREQ: An asynchronous request. For example, a callback event or a function call with no return value would use an AREQ command.
- 3: SRSP: A synchronous response. This type of command is only sent in response to a SREQ command. For an SRSP command the subsystem and ID are set to the same values as the corresponding SREQ. The length of an SRSP is generally nonzero, so an SRSP with length=0 can be used to indicate an error.
- 4-7: Reserved.

Subsystem: The subsystem of the command. Values are shown below:

Subsystem Value	Subsystem Name
0	RPC Error interface
1	SYS interface
2	Reserved
3	Reserved
4	AF interface
5	ZDO interface
6	Simple API interface
7	UTIL interface
8-32	Reserved

Table 2: Subsystem values

ID: The command ID. The ID maps to a particular interface message. Value range: 0-255.

When the ZNP cannot recognize an SREQ command from the host processor, the following SRSP is returned:

SRSP:

1	1	1	1	1	1
Length = 0x03	Cmd0 = 0x60	Cmd1 = 0x00	ErrorCode	ReqCmd0	ReqCmd1

Figure 10: SRSP response

Attributes:

Attribute	Length (byte)	Description										
ErrorCode	1	The error code maps to one of the following enumerated values.										
		<table><tr><th>Value</th><th>Description</th></tr><tr><td>0x01</td><td>Invalid subsystem</td></tr><tr><td>0x02</td><td>Invalid command ID</td></tr><tr><td>0x03</td><td>Invalid parameter</td></tr><tr><td>0x04</td><td>Invalid length</td></tr></table>	Value	Description	0x01	Invalid subsystem	0x02	Invalid command ID	0x03	Invalid parameter	0x04	Invalid length
		Value	Description									
		0x01	Invalid subsystem									
		0x02	Invalid command ID									
		0x03	Invalid parameter									
0x04	Invalid length											
ReqCmd0	1	The Cmd0 value of the processed SREQ										
ReqCmd1	1	The Cmd1 value of the processed SREQ										

4. Agency Statements

FCC Statements

Compliance Statement (Part 15.19)

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.

Warning (Part 15.21)

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

RF Exposure

For stand-alone configurations, usage of this module will inherently be compliant for current RF exposure applications in Portable conditions (<20cm usage) in either head/body or extremity configurations. The module is SAR exempt according to KDB 447498 Section 4.3.1. Standalone SAR test exclusion considerations. At 5mm separation the module meets Portable exposure conditions exemption.

OEM Responsibilities to comply with FCC Regulations

The SERIE Module has been certified for integration into products only by OEM integrators under the following conditions:

1. The host equipment must provide DC regulation to the module.
2. The transmitter module must not be co-located or operating in conjunction with any other antenna or transmitter, except in accordance with the FCC multi-transmitter product procedures.

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.).

IMPORTANT NOTE: In the event that these conditions cannot be met (for certain configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these

circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End Product Labelling

The SERIE Module is labelled with its own FCC ID Certification Number. 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. In that case, the final end product must be labelled in a visible area with the following:

“Contains Transmitter Module FCC ID: 2ABTD-SERIE1”

or

“Contains FCC ID: 2ABTD-SERIE1”

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module or change RF related parameters in the user manual of the end product.

5. Revision history

Revision	Date	Description	Author
0v0	04-01-2014	Initial release	Alberto Martin
0v3	04-30-2014	Protocol interface included	Alberto Martin