TiWi-SL EM Board

User Guide

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Table of Contents

1 Introduction

1.1 Purpose & Scope

The purpose of this document is to provide details regarding the setup and use of the TiWi-SL module on an EM board. This document covers a description of the EM board and its features and a brief tutorial on how to operate the module EM board.

1.2 Applicable Documents

- *TiWi-SL Datasheet* (*330-0085)*

1.3 Revision History

Date	Change Description	Revision
11/17/2011	Initial release	1.0

Table 1 Revision History

2 TiWi-SL Module Description

The TiWi-SL EM "Evaluation Module" Board is an evaluation platform for the LS Research TiWi-SL 802.11 b/g Wi-Fi module. Communication between the TiWi-SL module, which is a slave, and the host device is through an SPI interface.

The TiWi-SL EM Board contains an on board chip antenna, and is intended for evaluation purposes when used in conjunction with the Texas Instruments MSP-EXP430FR5739 Experimenter Board.

Figure 1 – TiWi-SL EM Board Top

Figure 2 – TiWi-SL EM Board Bottom

3 TiWi-SL EM Board Hardware

3.1 Antenna

The TiWi-SL EM Board contains an on board chip antenna which is modular certified for FCC 15.247 and IC RSS-210, as well as compliant to the RF requirements for ETSI EN 300 328 and ETSI EN 301 489. The antenna layout and circuitry on the EM Board can be replicated on a custom designed PCB assembly. Assuming the design/layout are followed exactly as that which is on the EM Board, the custom PCB will retain the modular certification. Below are details on the certifications.

FCC ID: TFB- TIWISL01, 15.247

IC ID: 5969A- TIWISL01, RSS 210

3.2 Connectors

There are two primary connectors on the TiWi-SL EM Board, one which is used for setting the operating mode and the other which provides power to the module. Two additional non populated connectors provide access to all of the significant signals on the module.

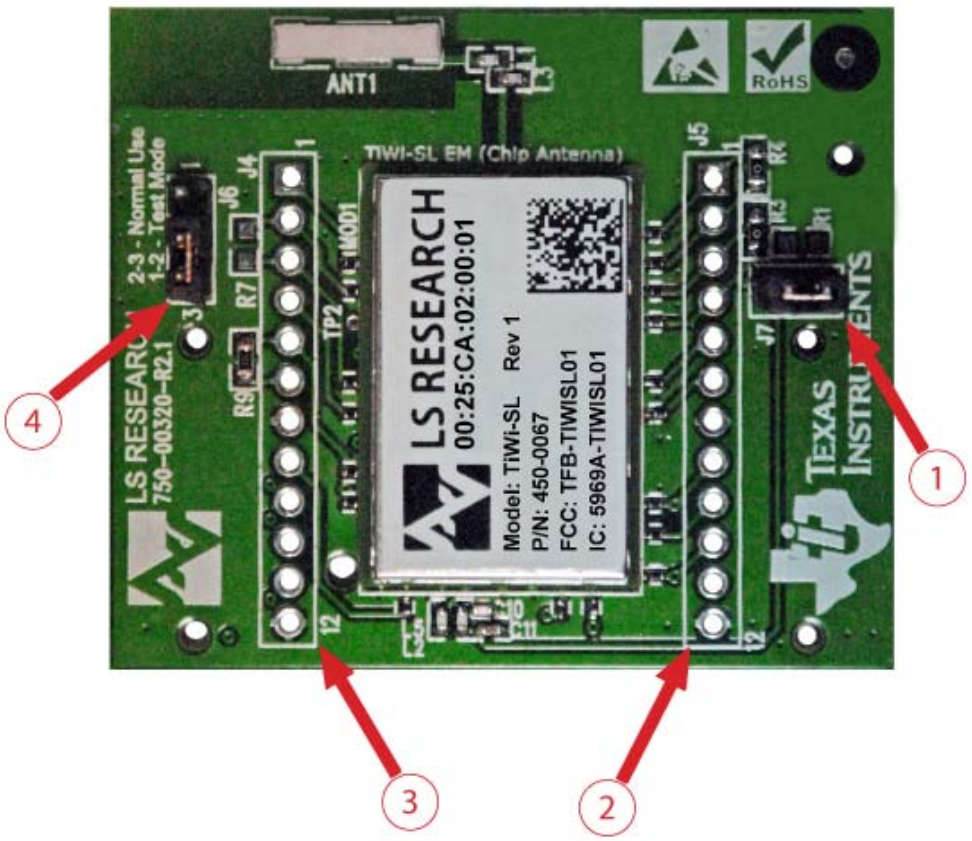

Figure 3 – TiWi-SL EM Board Top Side Connectors

Numbered Item	Connector	Description
1	J7	Allows for measuring the module's power supply current. In normal operation this connector should have a shunt jumper connecting the pins together. For measuring current an ammeter can be connected in series between pins 1 and 2.
2	J5	This is a non populated connector that exposes signals from the module. Refer to Table 7 for more details.
3	J4	This is a non populated connector that exposes signals from the module. Refer to Table 6 for more details.
4	J6	Determines the operating mode of the module. For normal operation mode, a shunt jumper needs to be connected between pins 2 and 3.

Table 2 – TiWi-SL EM Board Top Side Connectors

3.3 Required Signals between EM Board and Host Device

In addition to power and ground, there are six signals required to connecting a TiWi-SL module to a host device. See Table 3 below for details on these connections.

Signal Name	Description
VCC	Power to the module
GND	Ground
PWR_EN	Active high module power enable which is an input to the module and an output from the host device.
/SPI_IRQ	Active low SPI Interrupt Request which is output from the module and an input to the host device.
/SPI_CS	Active low SPI Chip Select which is an input to the module and an output from the host device.
SPI_CLK	SPI Clock which is an input to the module and an output from the host device.
SPI_DO	SPI Data Out which is an output from the module and an input to the host device.
SPI_DI	SPI Data In which is an input to the module and an output from the host device.

Table 3 – TiWi-SL Required Connections

3.4 Connecting EM Board to Host Platform

The TiWi-SL EM Board is intended to allow for evaluation of and early development with a TiWi-SL module. The EM Board has two "EM" connectors on the bottom of the board that allows for easy connection to various Texas Instruments microcontroller development platforms. The primary development platform is the MSP-EXP430FR5739 Experimenter Board.

It is also possible to adapt the TiWi-SL EM Board to work with microcontroller platforms that do not have support for the EM connectors. Sections 3.4.1 and 3.4.2 describe the two options for adapting an EM Board to work with other microcontroller platforms.

3.4.1 Option 1: Using EM Connectors

Either build a PCB which has the EM Board mating connectors which will allow for plugging the TiWi-SL EM Board into, or solder wires to EM Board mating connectors that can then be wired into whatever development platform is being used.

Below are two suggestions, the mating EM connectors.

Through hole connector: Samtec TFM-110-01-S-D-WT
Surface Mount connector: Samtec SFM-110-02-L-D-A

If building a PCB that has the mating EM Board connectors, the connectors need to be lined up and spaced 1.2" apart as shown in Figure 4.

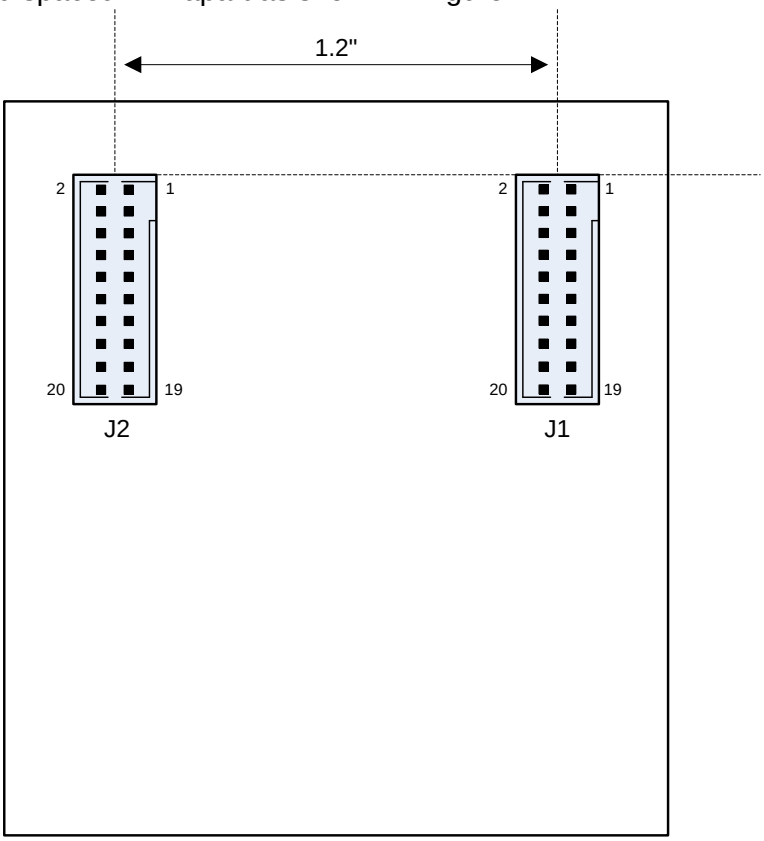

Figure 4 – Host PCB EM Mating Connector Arrangement (Bottom View)

Refer to Table 4 and Table 5 below for details on the signals brought out to the EM connectors J1 and J2.

J1 Pin Number	Pin Name	Module Pin Type	Description
1	GND		Ground
10	PWR_EN	DI	Active high module power enable that should be controlled by the host device.
12	/SPI_IRQ	DO	Host interface active low SPI Interrupt Request output signal, which is used for communicating to the module with a host device.
14	/SPI_CS	DI	Active low SPI Chip Select input signal, which is used for communicating to the module with a host device.
16	SPI_CLK	DI	Host interface SPI Clock input signal, which is for communicating to the module with a host device.
18	SPI_DI	DI	Host interface SPI Data Input signal, which is used for communicating to the module with a host device.
19	GND		Ground
20	SPI_DO	DO	Host interface SPI Data Output signal, which is used for communicating to the module with a host device.

Table 4 – EM Connector J1

J2 Pin Number	Pin Name	Module Pin Type	Description
2	GND		Ground
7	VCC	PI	Power to the module.
9	VCC	PI	Power to the module.

Table 5 – EM Connector J2

DI = Digital Input; DO = Digital Output; PI = Power Input

3.4.2 Option 2: Using Single Row Headers

Solder single row 12 pin 2mm headers into locations J4 and J5 on the EM Board, and then build a wiring harness between the headers on the EM Board and the microcontroller development platform of interest.

Below is a suggestion for the 12 pin 2mm headers.
Sullins NRPN121PAEN-RC

Refer to Table 6 and Table 7 below for details on the signals brought out to the single row headers J4 and J5.

J4 Pin Number	Pin Name	Module Pin Type	Description
1	NC1		No Connect 1, leave this pin unconnected.
2	NC2		No Connect 2, leave this pin unconnected.
3	NC3		No Connect 3, leave this pin unconnected.
4	UART_TX	DO	Test UART transmit output (1.8v logic). Used for low level test modes which are not intended for general usage. Leave this spin unconnected for normal operation.
5	UART_RX	DI	Test UART receive input (1.8v logic). Used for low level test modes which are not intended for general usage. Leave this pin unconnected for normal operation.
6	NC6		No Connect 6, leave this pin unconnected.
7	GND		Ground
8	PWR_EN	DI	Active high module power enable that should be controlled by the host device.
9	VCC	PI	Power to the module.
10	SPI_DI	DI	Host interface SPI Data Input signal, which is used for communicating to the module with a host device.
11	SPI_CLK	DI	Host interface SPI Clock input signal, which is for communicating to the module with a host device.
12	GND		Ground

Table 6 – Single Row Header J4

DI = Digital Input; DO = Digital Output; PI = Power Input

J5 Pin Number	Pin Name	Module Pin Type	Description
1	SCL_CC	DO	I2C clock signal output from the CC3000 (1.8v logic). This pin is connected to the SCL_EE pin through a zero ohm resistor. This pin is not intended to be used by the end user and should be left unconnected.
2	SCL_EE	DI	I2C clock signal input from the on module EEPROM (1.8v logic). This pin is connected to the SCL_CC pin through a zero ohm resistor. This pin is not intended to be used by the end user and should be left unconnected.
3	SDA_CC	DIO	I2C data signal from the CC3000 (1.8v logic). This pin is connected to the SDA_EE pin through a zero ohm resistor. This pin is not intended to be used by the end user and should be left unconnected.
4	SDA_EE	DIO	I2C data signal from the on module EEPROM (1.8v logic). This pin is connected to the SDA_CC pin through a zero ohm resistor. This pin is not intended to be used by the end user and should be left unconnected.
5	NC5	-	No Connect 5, leave this pin unconnected.
6	NC4	-	No Connect 4, leave this pin unconnected.
7	GND	GND	Ground
8	/SPI_IRQ	DO	Host interface active low SPI Interrupt Request output signal, which is used for communicating to the module with a host device.
9	SPI_DO	DO	Host interface SPI Data Output signal, which is used for communicating to the module with a host device.
10	/SPI_CS	DI	Active low SPI Chip Select input signal, which is used for communicating to the module with a host device.
11	VCC	PI	Power to the module.
12	GND	GND	Ground

Table 7 – Single Row Header J5

DI = Digital Input; DO = Digital Output; PI = Power Input

3.5 Schematic

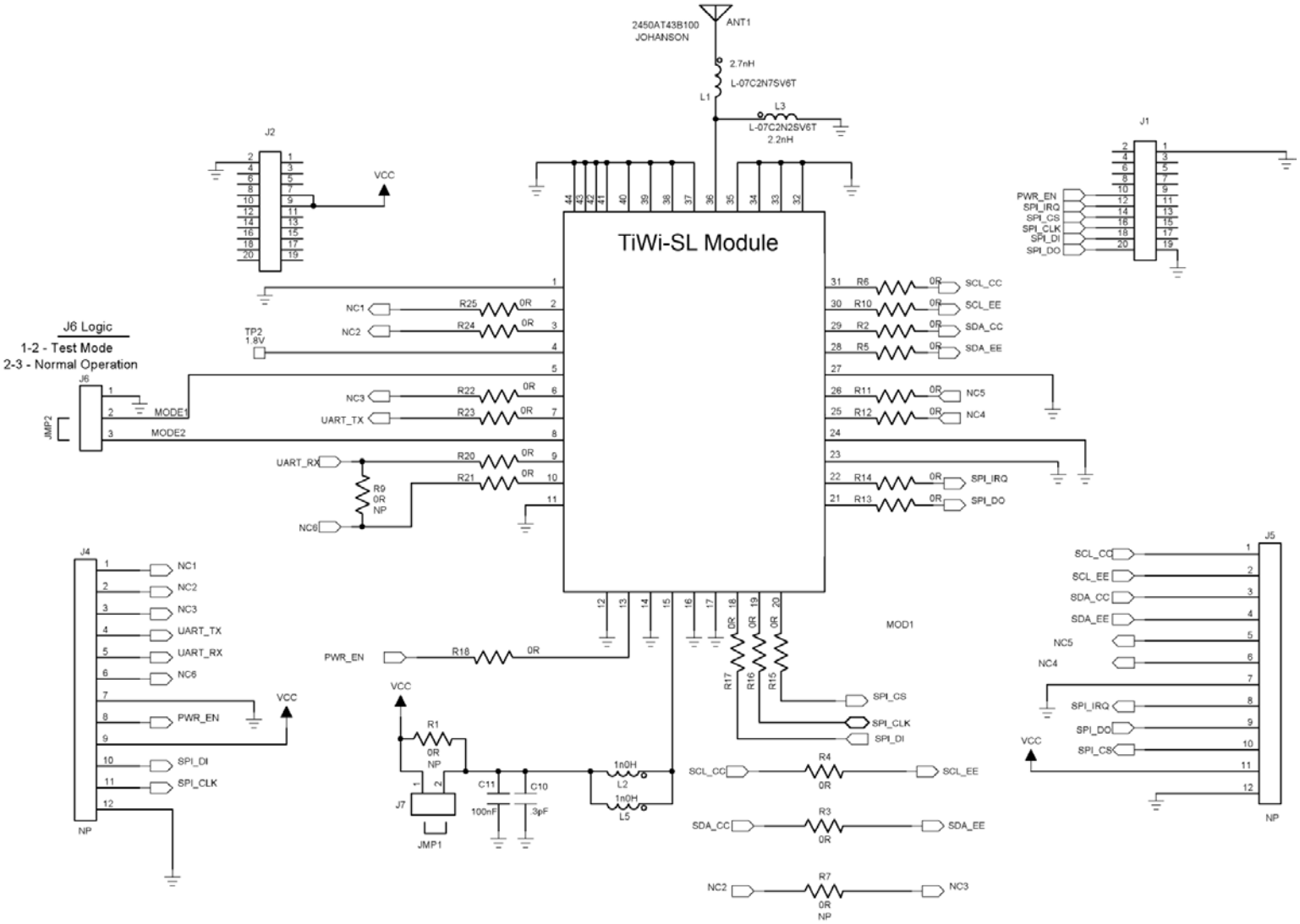

Figure 5 – TiWi-SL EM Board Schematics

3.6 Bill Of Material (BOM)

Reference Designator	Description
ANT1	2.45GHz Chip Antenna, Johanson 2450AT43B100
C10	.3pF, 0201, Ceramic Capacitor, Johanson 250R05L0R3AV4T
C11	100nF, 0402, Ceramic Capacitor, Murata GRM155R71C104KA88
J1, J2	Socket Strip, .050” (1.27mm) Pitch, 20 Pins, SMT, Samtec SFM-110-02-L-D-A
J4, J5	12 Pin, 2mm, Single Row Through Hole Header, Sullins NRPN121PAEN-RC (NOT POPULATED)
J6	3 Pin, 2mm, Single Row Through Hole Header, Sullins NRPN031PAEN-RC
J7	2 Pin, 2mm, Single Row Through Hole Header, Sullins NRPN021PAEN-RC
JMP1 JMP2	Shunt Jumper, 2mm, Harwin Inc M22-1900005
L1	2.7nH, 0402, Monolithic Inductor, Johanson L-07C2N7SV6T
L2	1.0nH, 0402, Monolithic Inductor, Murata LQG15HN1N0S02
L3	2.2nH, 0402, Monolithic Inductor, Johanson L-07C2N2SV6T
L5	1.0nH, 0402, Monolithic Inductor, Murata LQG15HN1N0S02
MOD1	LS Research TiWi-SL Module
PCB1	PCB
R1 R7	0 ohm, 0603, Resistor (NOT POPULATED)
R2 R5 R6 R10 R11 R12 R13 R14 R15 R16 R17 R18 R20 R21 R22 R23 R24 R25	0 ohm, 0201, Resistor
R3 R4	0 ohm, 0603, Resistor

Table 8 – TiWi-SL EM Board BOM

4 Application Development

Texas Instruments has developed Wireless LAN software examples that run on the MSP-EXP430FR5739 Experimenter Board. Further specifics on the examples can be found on the Connectivity wiki at

http://processors.wiki.ti.com/index.php/CC3000_Wi-Fi_for_MCU.

The MSP-EXP430FR5739 Experimenter Board can be ordered here:

http://www.ti.com/tool/msp-exp430fr5739

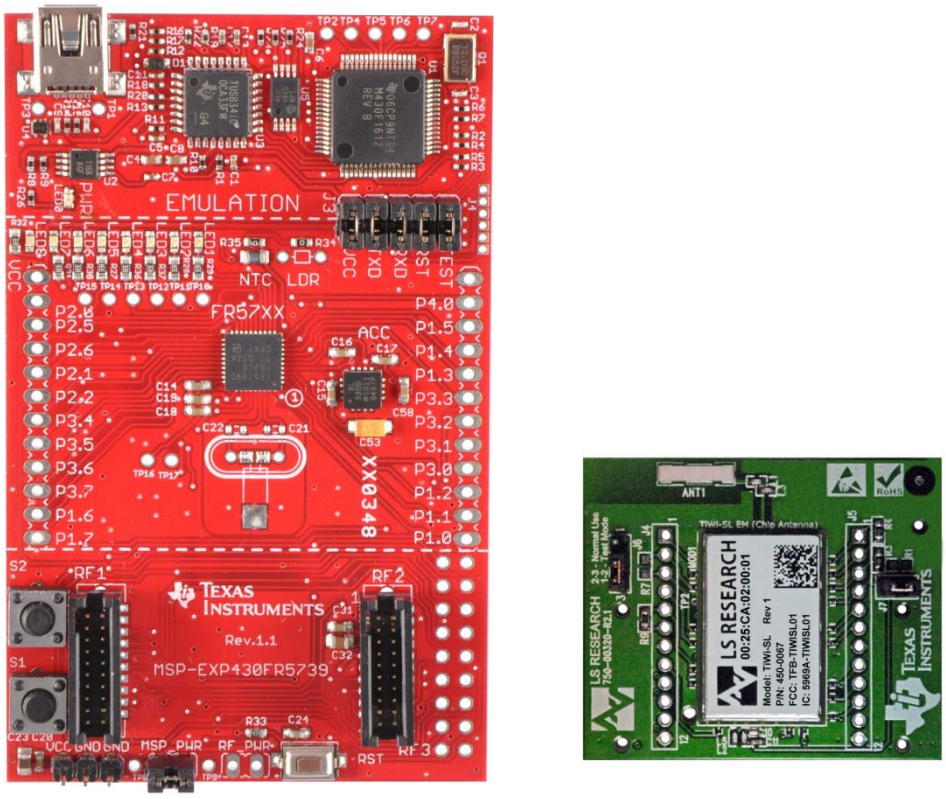

Figure 6 – Experimenter Board and TiWi-SL EM Board

5 Contacting LS Research

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