LANCOM Systems

ESL/BLE Module

ESLREVC2

User Manual / Product Specification

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This product description does not lodge the claim to be complete and free of mistakes.
Please contact the related product manager in every case.

Document History

Date	Version	Changes
14.09.2016	0.1	Initial version
19.09.2016	0.2	1st review
20.09.2016	0.3	Content added
21.09.2016	0.4	Power supply, minor changes
27.09.2016	0.5	Interfaces, IC description and Abbreviations added
13.10.2016	0.6	Changes in ch. Key features, ESL core, BLE core, RF Front-End, operating conditions, FCC compliance

Content

List of Abbreviations

BLE	Bluetooth Low Energy
CE	Communauté Européenne
ESL	Electronic-Shelf-Label
FCC	Federal Communications Commission
GPIO	General Purpose Input Output
I^2C	Inter-Integrated Circuit
IC	Integrated Circuit
LNA	Low Noise Amplifier
MCU	Microcontroller Unit
OEM	Original Equipment Manufacturer
PA	Power Amplifier
PCB	Printed Circuit Board
RAM	Random Access Memory
RF	Radio Frequency
RoHS	Restriction of Hazardous Substances
SoC	System on Chip
SPI	Serial Peripheral Interface
UART	Universal Asynchronous Receiver Transmitter
WLAN	Wireless Local Area Network

1 Key Features

The ESL (Electronic-Shelf-Labeling) module is a dual RF transceiver (PCB board). It contains two System on Chip (SoC) RF controllers from Texas Instruments, CC2510 and CC2541, operating in the 2.40 GHz ISM band. Each of the transceivers is connected to an RF Front-End IC with integrated low noise amplifiers (LNAs) and power amplifiers (PAs) for range extension. Due to the usage of the same operating frequency bands of both transceivers, a coexistence logic has been integrated onto the module. This prevents the BLE (Bluetooth Low Energy) section as well as any 2.4 GHz WLAN connected to the module from transmitting while ESL is receiving data. The occupied frequencies for the ESL and BLE transceiver are listed in Table 1 and Table 2, respectively.

Table 1: ESL Frequencies

ESL Channel #	Frequency [MHz]
0	2404
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	2479.4

Table 2: BLE Frequencies

BLE Channel #	Frequency [MHz]
0	2402
:	
39	2480

2 Block Diagram

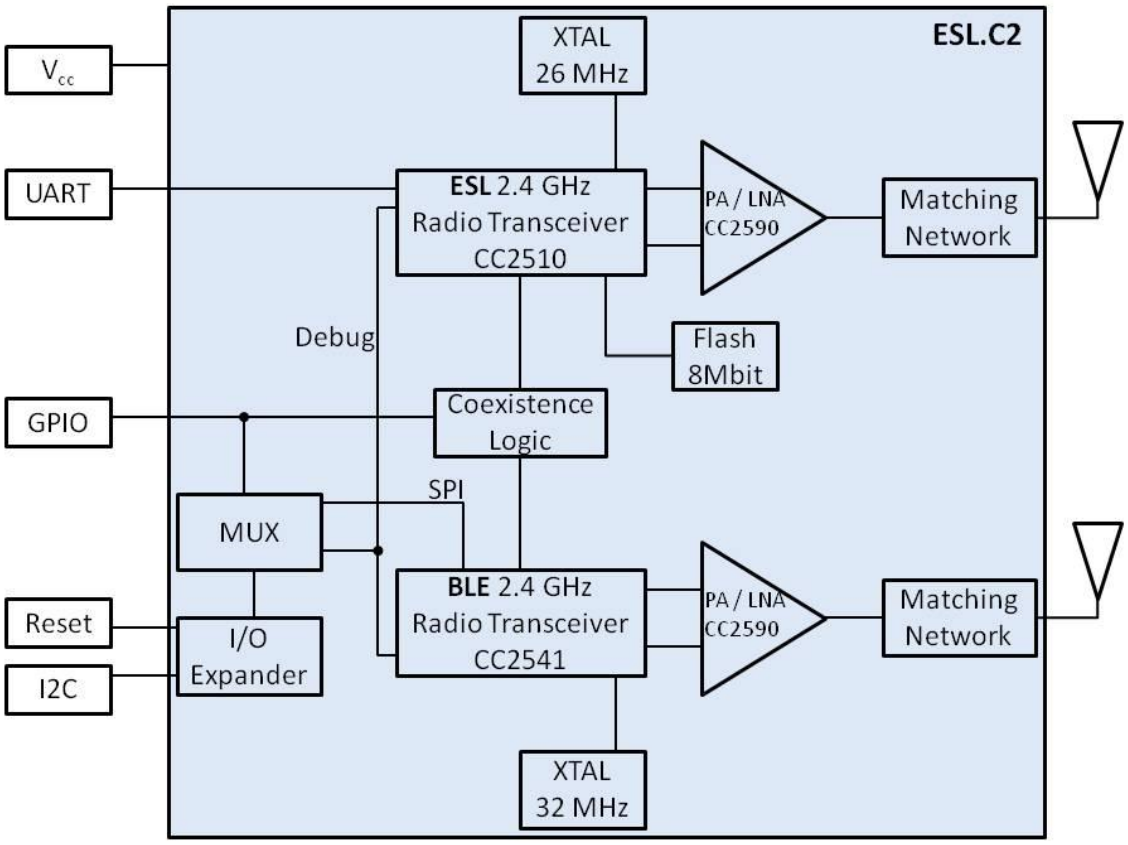

Figure 1: ESLREVC2 block diagram

3 System Overview

3.1 Mechanical data

The core ICs of the ESLREVC2 module as well as the location of the external interfaces are shown in Figure 2 via CN301 and CN303:

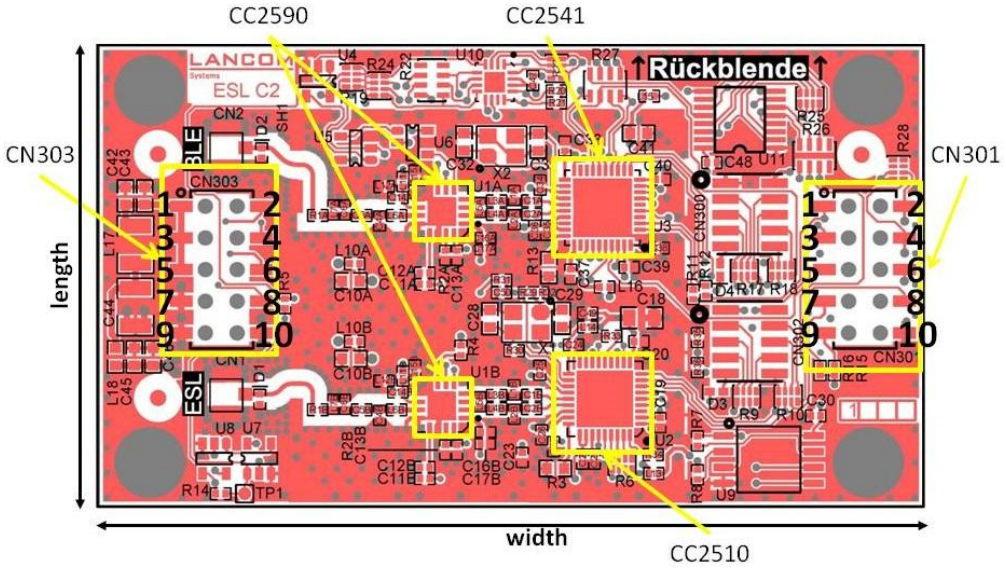

Figure 2: ESL-Module with I/O Ports and ICs

3.2 Pin and I/O Port Configuration

Table 3: CN303 Pin Configuration

Pin	Pin Name	Pin Type	Description
1	3V3_MB	Power	Analog
2	SPI_CLK	I/O	Digital
3	3V3_MB	Power	Analog
4	SPI_MOSI	I/O	SPI
5	3V3_MB	Power	Analog
6	SPI_MISO	I/O	SPI
7	GND	Ground	
8	PWR_ON_RST-	Input	Reset, active low
9	GND	Ground	
10	GND	Ground	

Table 4: CN301 Pin Configuration

Pin	Pin Name	Pin Type	Description
1	I2C_SDA	I/O	I2C Clock or digital I/O
2	ESL_TXD	I/O	UART
3	I2C_SCL	I/O	I2C Clock or digital I/O
4	ESL_RXD	I/O	UART
5	BLE_INT-	I/O	Digital I/O
6	ESL_CTS	I/O	UART
7	WLAN_GPIO15	I/O	GPIO
8	ESL_RTS	I/O	UART
9	WLAN_GPIO7	I/O	GPIO
10	GND	Ground	

3.3 ESL Core

The ESL Core consists of a Low-Power SoC (System on Chip) CC2510, including a MCU (Microcontroller Unit), flash memory and RAM (Random Access Memory), an RF Transceiver for the 2400 – 2483.5 MHz ISM Band and a USB Controller. To test the properties of the module and to program the controllers' flash memory, test commands are implemented which use the debug interface of the controllers to set up the test modes.

For a more detailed description, please refer to the TI CC2510 datasheet[1].

3.4 BLE Core

The BLE Core is a CC2541 SoC from Texas Instruments for Bluetooth low energy and proprietary 2.4 GHz applications. It includes a MCU, flash and RAM.
For a more detailed description, please refer to the TI CC2541 datasheet[2].

3.5 RF Front-End

The RF Front End for both ESL and BLE section consists of a TI CC2590 integrated circuit with an integrated T/R switch for the transmit and the receive path. Both paths contain a PA and LNA, respectively. The typical improved sensitivity on the CC2510 and CC2541 is about 6 dB. An integrated balun transforms the unbalanced antenna interface to a balanced differential signaling on the PCB.
For a more detailed description, please refer to the TI CC2590 datasheet[3].

4 Interfaces

4.1 UART

The UART is compliant to the industry-standard 16550 and is used as a communication link between the motherboard and the CC2510 ESL core.

4.2 SPI

The serial peripheral interface bus is a synchronous serial communication interface specification used for short distance communication, primarily in embedded systems. It is used to enable the communication via the debug interface for the ESL and BLE sections of the module, as well as the flash programming. A communication link with the motherboard is realized via SPI.
SPI™ is a trademark of Motorola, Inc.

4.3 I²C

The I²C is a programmable control bus that provides support for the communications link between Integrated Circuits in a system. It is a simple two-wire bus with a software-defined protocol for system control, which is used in a temperature sensors and voltage level translators to EEPROMs, general-purpose I/O, A/D and D/A converters.

4.4 GPIO

The general purpose input output provides the communication link between the ESL module and its motherboard regarding the coexistence of WLAN signals. In case the ESL module is receiving data, a signal is sent via the GPIO in order to shut down WLAN transmission in the 2.4 GHz Band of the device.

[1] http://www.ti.com/lit/ds/symlink/cc2510.pdf
[2] http://www.ti.com/lit/ds/symlink/cc2541.pdf
[3] http://www.ti.com/lit/ds/symlink/cc2590.pdf

5 Specifications

5.1 Operating Conditions

Table 5: Power Consumption

Parameter	Description	Typical Value	Maximum Value	Unit
V_{CC}	Supply Voltage	3.3	3.6	V
I_{CC}	Supply Current	50	100	mA

Therefore, the maximum power consumption is 360 mW. The chipset is designed for operation with supply from primary or rechargeable batteries. Thus, the integrated circuits are internally stabilized, the radio interface characteristics are independent from the supply voltage.

6 Module Dimension

The corresponding labeling of the dimensions is depicted in Figure 2. The overall height is measured from the highest component of the bottom to the highest component of the top layer.

Table 6: Module Dimension

Dimension	Size / [mm]	Tolerance / [mm]
Width	66,0	±0,2
Length	37,0	±0,2
Overall Height	9,4	±0,4

7 Regulatory and Standards Compliance

[Refer to addendum]