Getting started with the STEVAL-ISB038V1R wearable wireless power receiver based on STWLC04
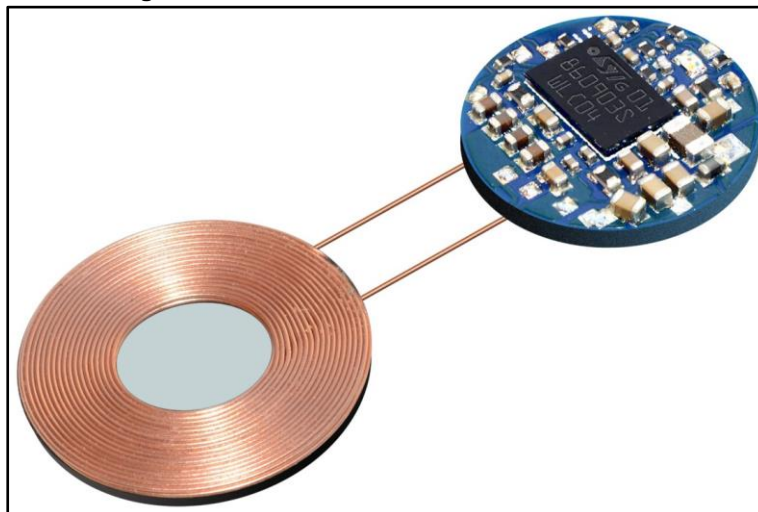
Introduction

This user manual explains the STEVAL-ISB038V1R hardware and software installation, as well as details on the board evaluation and the GUI interface.

The STEVAL-ISB038V1R wireless power receiver evaluation board is a reference design based on the STWLC04 device.

This receiver operates with the STWBC-WA wearable reference design (STEVAL-ISB038V1T) as a 5 V power supply or a simple CC/CV battery charger. Mode and parameter changes can be performed through the I²C bus which is easily accessible via the graphical interface.

Figure 1: STEVAL-ISB038V1R evaluation board

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1   Getting started

1.1   System requirements

To use the STEVAL-ISB038V1R RX board with the GUI, you need a PC with MicrosoftWindows® XP and higher.

The board is connected to the PC through the USB to I²C converter included in the STEVAL-ISB038V1R package.

1.2   Package contents

To evaluate the STEVAL-ISB038V1R board, you need:

* Hardware:
    - STEVAL-ISB038V1R board
    - the USB-I²C converter board
* Software:
    - PC GUI application (no drivers, no installation)
    - documentation: user manual

2 Hardware description and setup

2.1 System block diagram

Figure 2: STEVAL-ISB038V1R block diagram
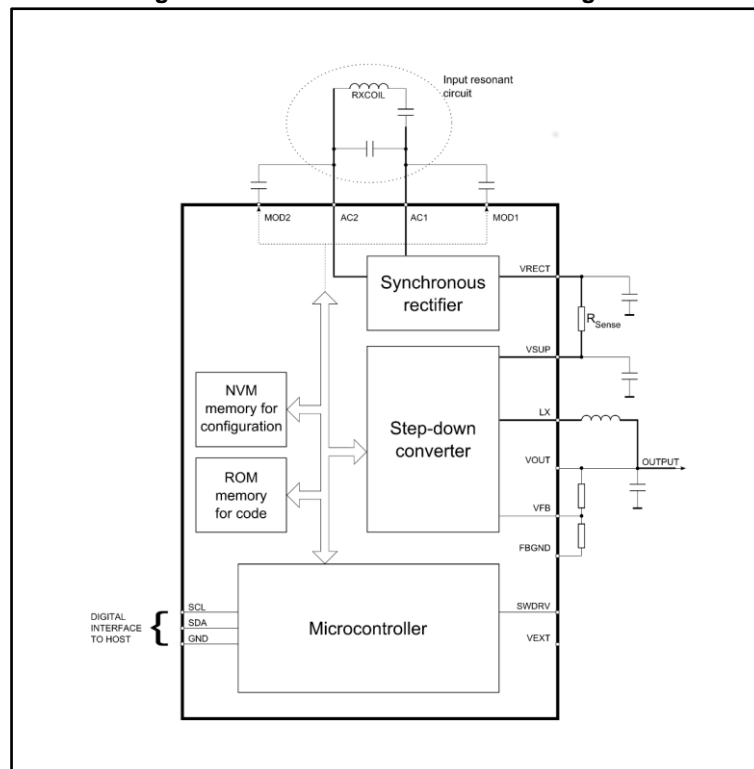
2.2 STEVAL-ISB038V1R RX wireless power receiver board

The STEVAL-ISB038V1R RX board has the following features:

- NVM memory to store default configuration
- a 5 V output or CC/CV charger (configurable)
- overvoltage, overcurrent and overtemperature protection
- a LED for power transfer progress status
- an I²C connection for the user interface and for default configuration update

Table 1: STEVAL-ISB038V1R electrical performance

Parameter	Description	Value	Unit
5 V mode			
Vout	Output voltage	5	V
Iout_range	Output current range	0.05 - 0.2	A
Charger mode			
Vout	Charge voltage	3.6 / 4.1 / 4.2	V
Ichg	CC Charging current	0.1 / 0.15 / 0.2	A
Ipre	Precharge current	0.05	A
Vpre	Precharge to CC charge threshold	2.5	V
Imin	Minimum output current	0.05	A

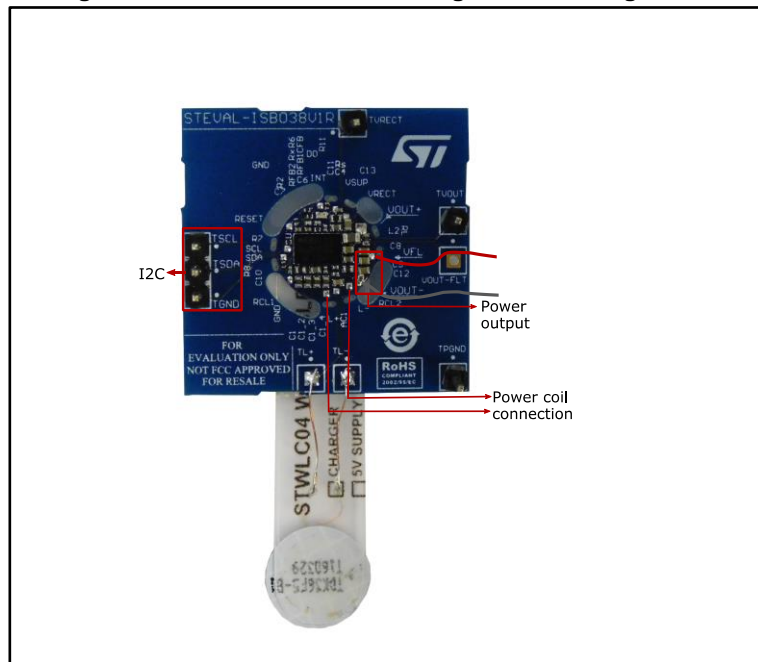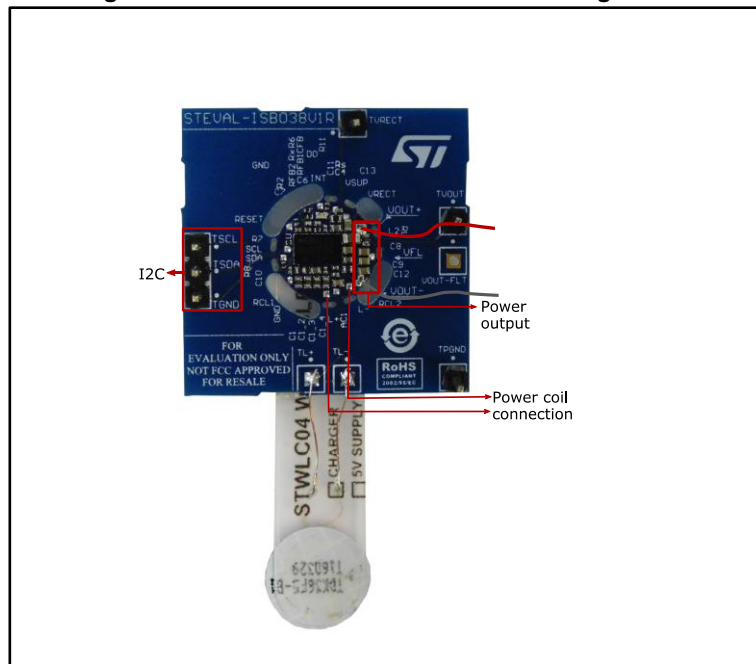**Figure 3: STEVAL-ISB038V1R charger mode configuration**

Figure 4: STEVAL-ISB038V1R 5 V mode configuration

2.3 Prerequisites

The following tools are necessary:

- a STEVAL-ISB038V1R board including the USB to I²C converter
- a USB to I²C converter
- a Windows PC and the STWLC04 GUI (no installation needed, no dedicated drivers)

2.4 Procedure

This GUI provides an easy way of configuring the most common parameters; the STWLC04 device configuration is, however, not limited to these.

The following picture shows the GUI main screen. To access the parameters, power the STWLC04 either by placing it on a Tx or by providing an external 5-7 V through TVRECT.

Figure 5: STWLC04 easy configuration GUI settings
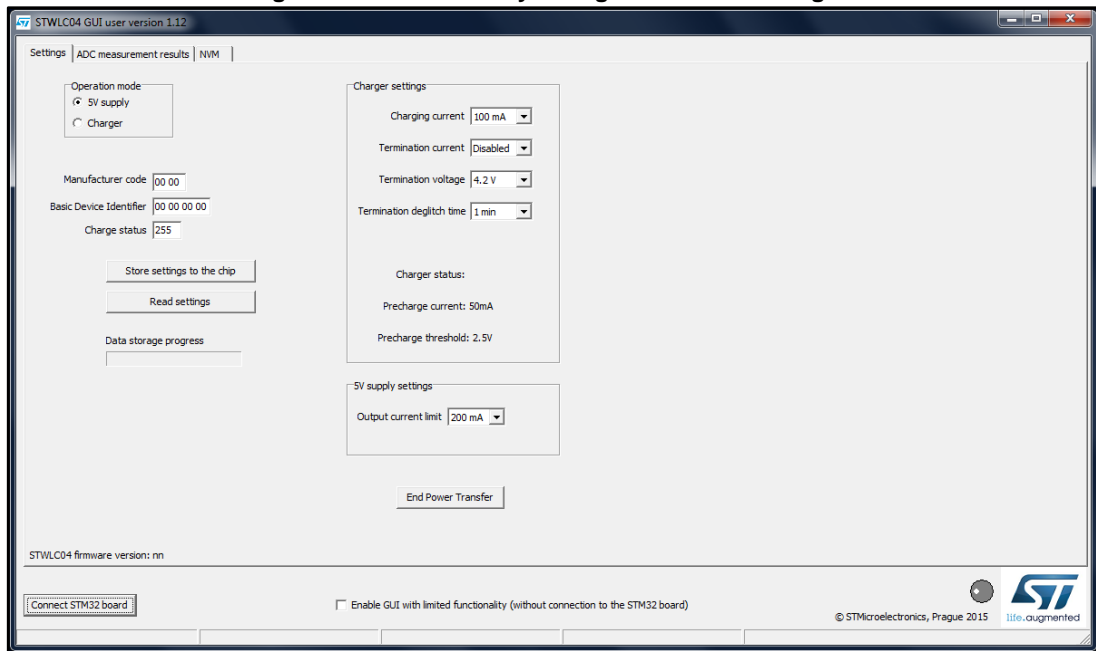
The wireless power receiver can operate in the following modes:

1.   5 V power supply
2.   CC/CV battery charger

Never set 5 V supply mode with battery connected to the device output.

In charger mode, the following parameters can be configured:

•   charging current
•   termination voltage
•   termination current
•   termination deglitch time

In 5 V power supply mode, only the output current limit can be configured.

In each operation mode, the manufacturer code and device identifier can be set. The device also provides charge status information.

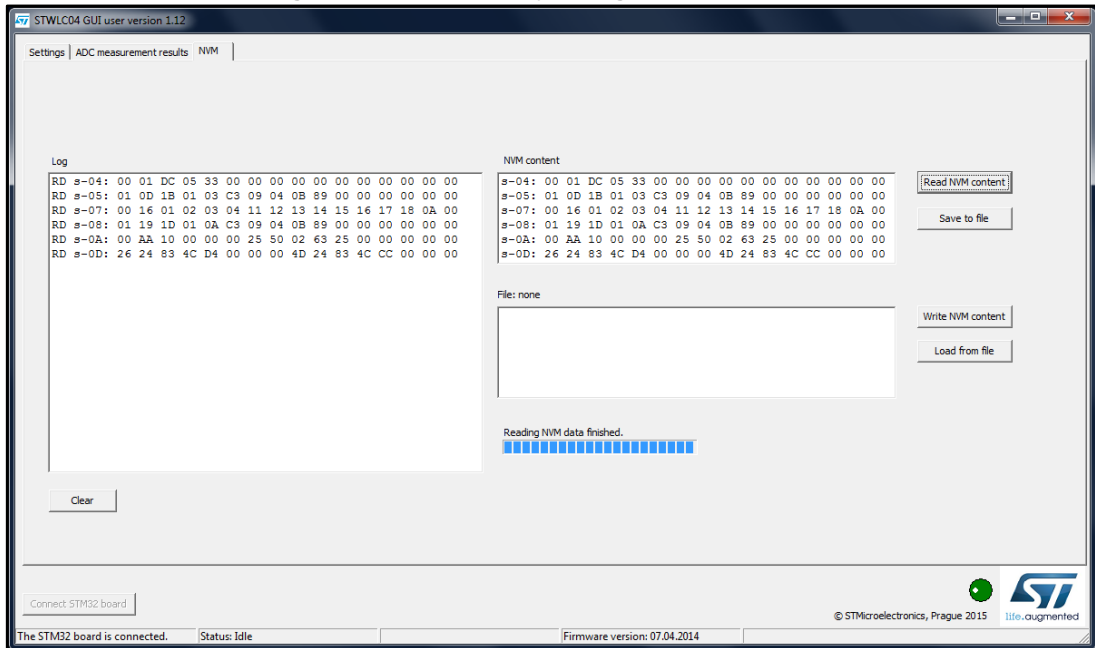The "ADC measurement results" tab in the figure below shows internally measured values.

Figure 6: STWLC04 easy configuration GUI ADC measurement results
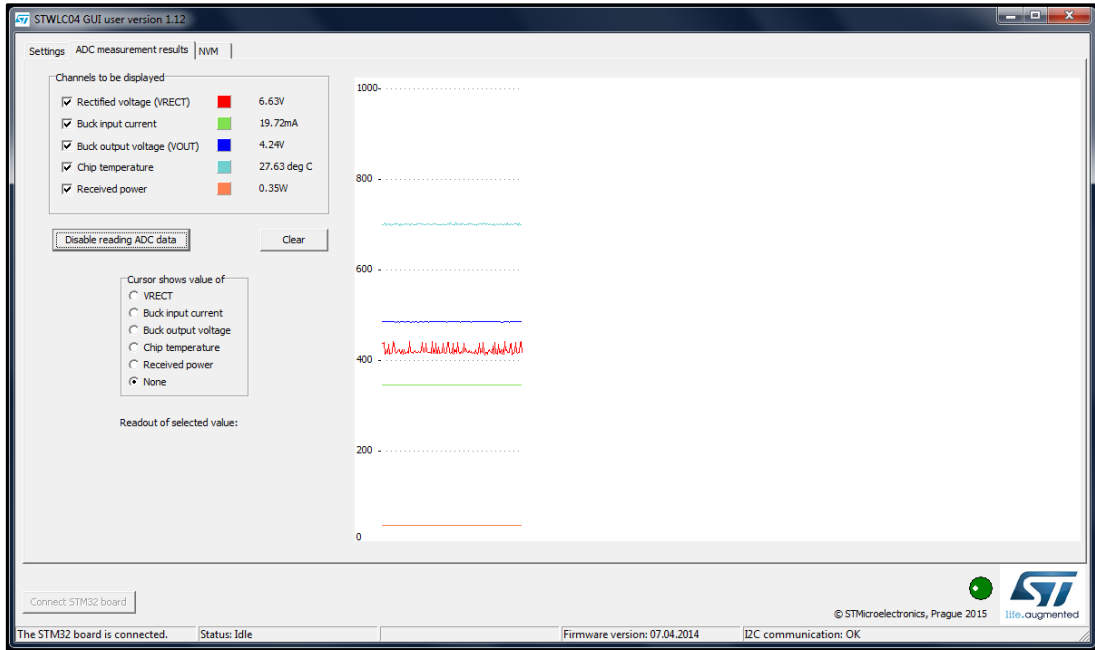
The "NVM" tab lets you download or update settings stored in the internal non-volatile memory.

Figure 7: STWLC04 easy configuration GUI NVM

3 Board diagrams

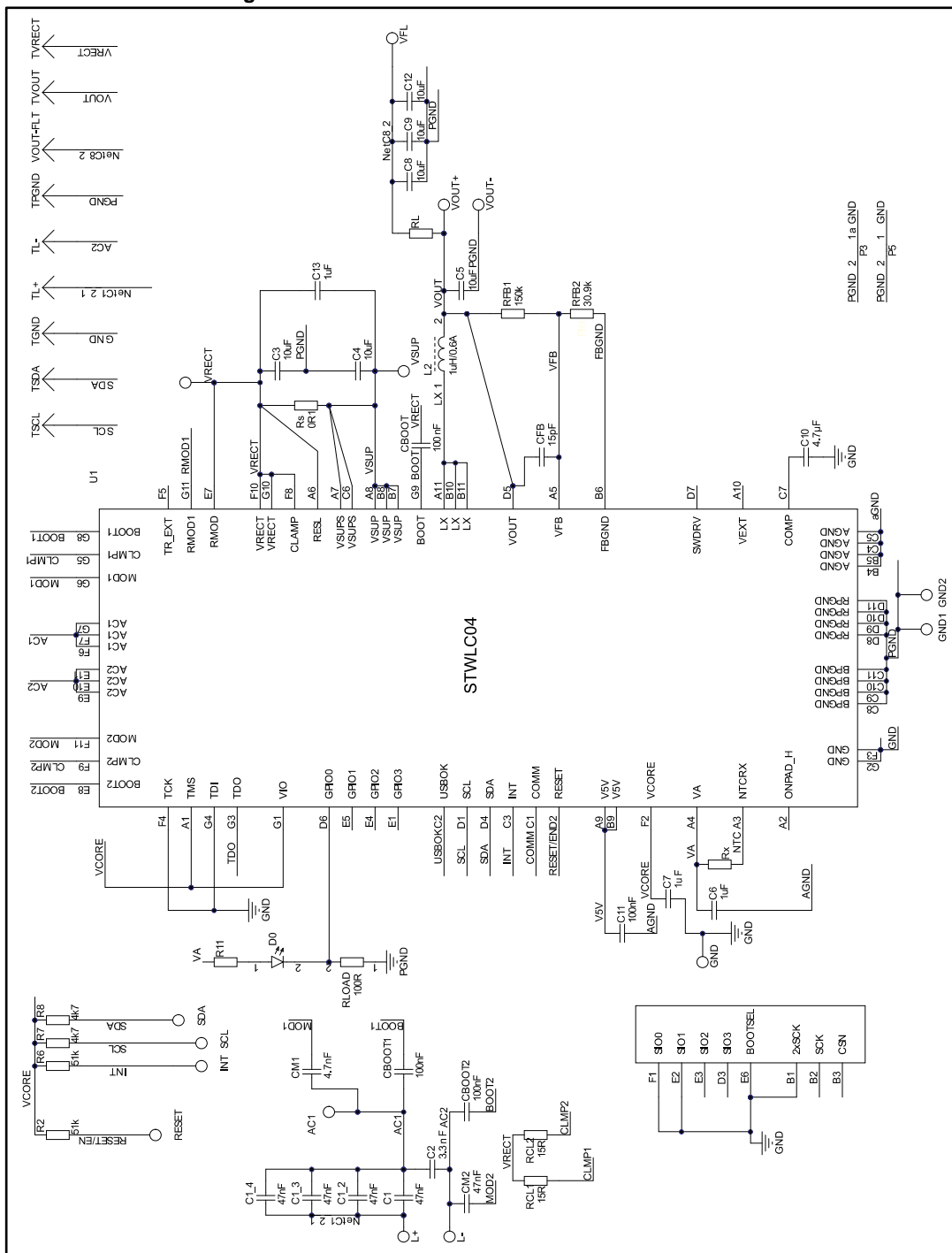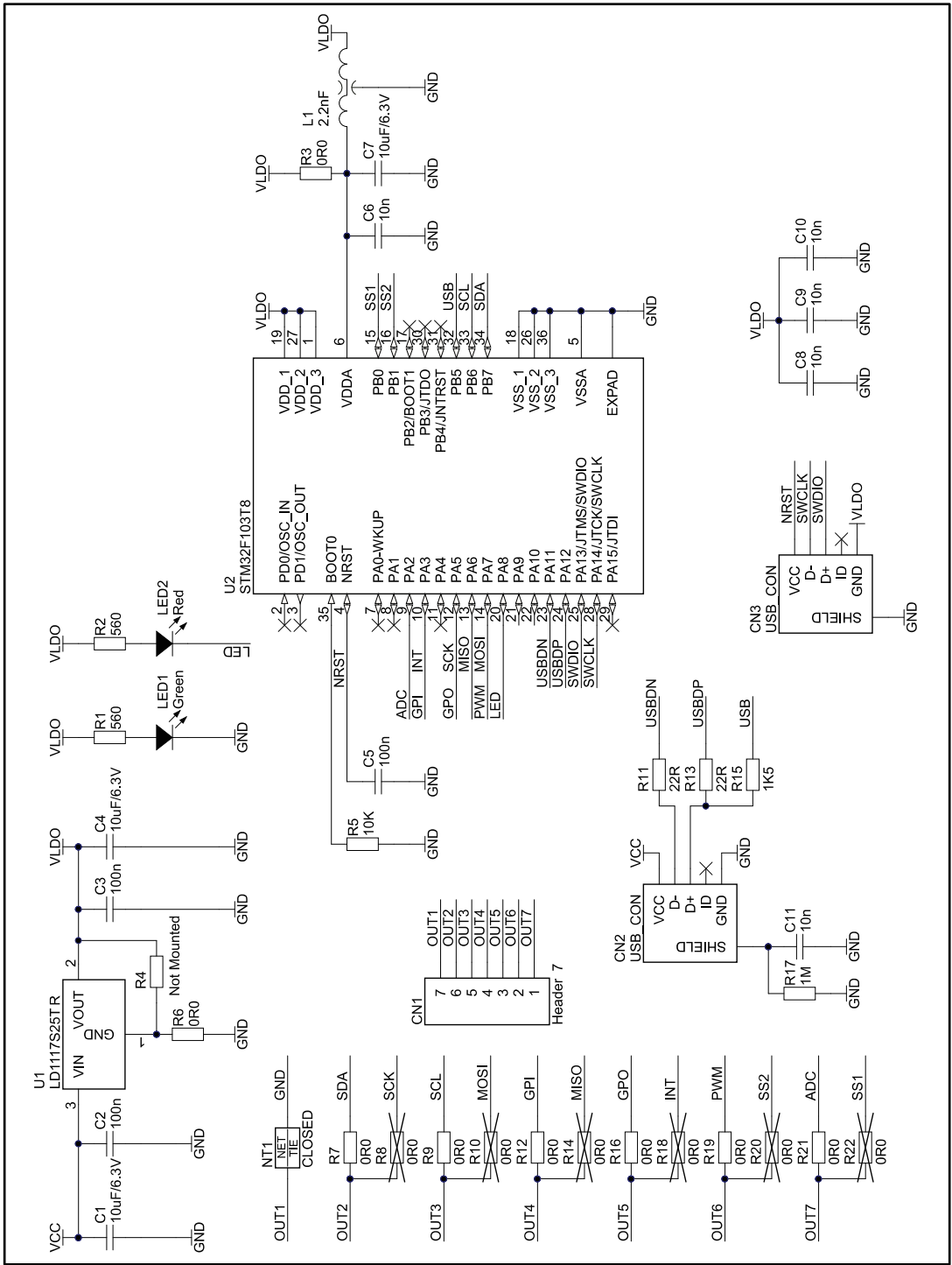**Figure 8: STEVAL-ISB038V1R RX circuit schematic**

Figure 9: STEVAL-ISB038V1R USB-I²C dongle

4 Receiver bill of materials

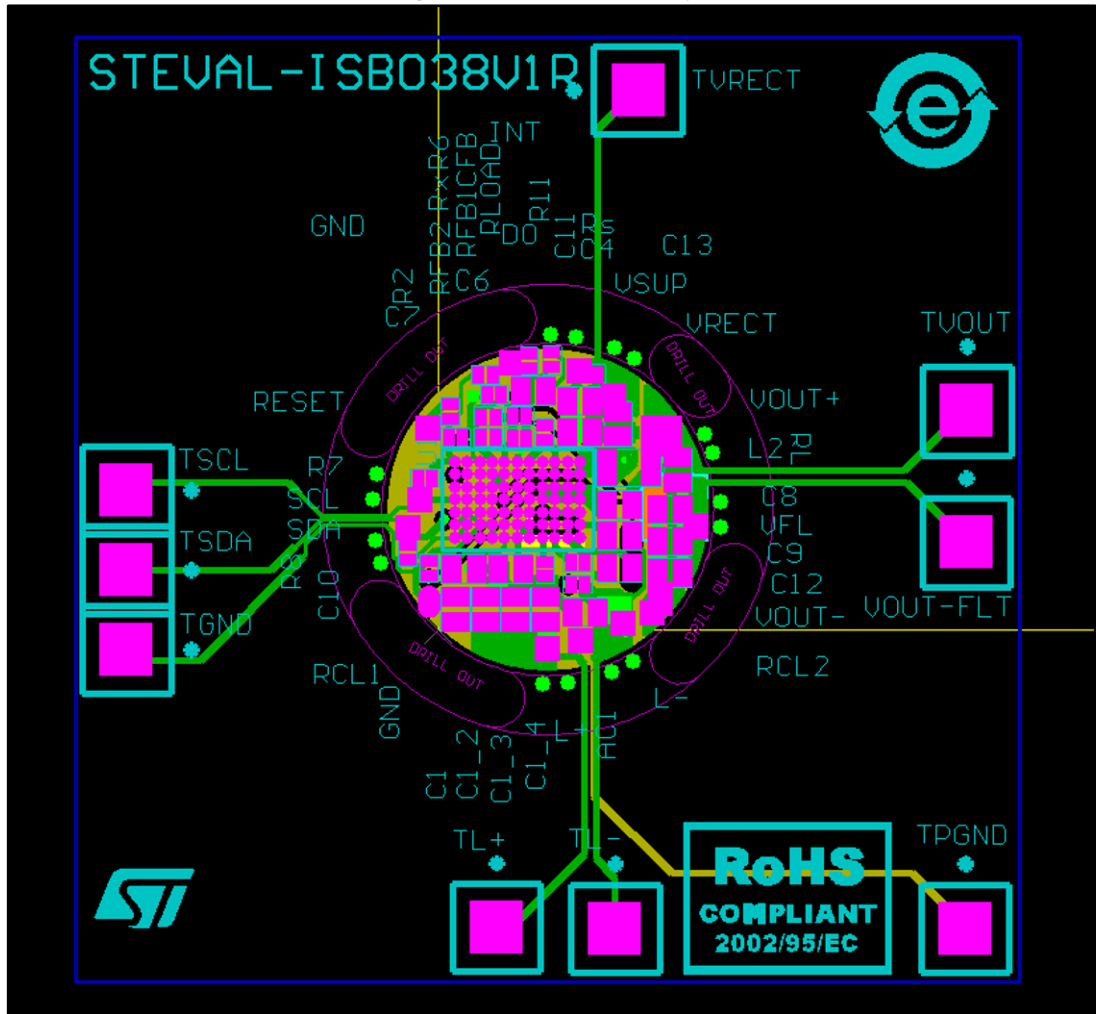**Table 2: STEVAL-ISB038V1R (receiver board) bill of materials**

Item	Quantity	Reference	Part/Value	Description	Manufacturer	Part number
1	4	C1, C1_2, C1_3, C1_4	47 nF/50 V/X5R		TDK	GRM155R61H473KE19
2	1	C2	3.3 nF/50 V		Murata	GRM155R71H332KA01
3	5	C3, C5, C8, C9, C12	10 µF/10 V/X5R		Murata	GRM155R61A106ME11
4	1	C4	1 µF/10 V		Murata	GRM155R61A105KE15D
5	3	C6, C7, C13	1 µF/6.3 V		Murata	GRM033R60J105MEA2D
6	4	C11, CBOOT, CBOOT1, CBOOT2	100 nF/10 V		Murata	GRM033R61A104KE84D
7	1	CM1	4.7 nF/50 V		Murata	GRM155R71H472KA01D
8	1	CM2	47 nF/50 V		Murata	GRM155R61H473KE19
9	2	RCL1, RCL2	15 R		Panasonic	ERJ-PA2J150X
10	1	CFB	15 pF/25 V		Murata	GRM0335C1H150JA01
11	1	L2	1 R0/600 mA		TOKO	MFD160806-1R0
12	3	R2, R6, Rx	51k			
13	2	R7, R8	4.7 k			
14	1	RFB1	150 k		STACKPOLE	RGC0201DTD150K-ND
15	1	RFB2	30.9 k		TE-CONNECTIVITY	7-2176074-1
16	1	Rs	0R10/1%		Panasonic	P.10AKCT
17	1	U1		Wearable wireless power receiver (STWLC04)	ST	STWLC04JR
18	1	RL	470 nH		Murata	LQB15NNR47J10D
19	1	RLOAD	100 R			
20	1	R11	1 k			
21	1	D0	2-5 mA	Red LED	Panasonic	LNJ247W82RACT
22	1	C10	4.7 µF/6.3 V		Murata	GRM035R60J475ME15D
23	1	Coil				WR111180-36F5-B1

Table 3: STEVAL-ISB038V1R (USB-I²C dongle) bill of materials

Item	Quantity	Reference	Part/ Value	Description	Manufacturer	Part number
1	3	C1, C4, C7	10 µF/6. 3 V	Capacitor	Murata	GRM155R60J106ME44
2	3	C2, C3, C5	100 n	Capacitor	Murata	GRM155R61H104KE14
3	5	C6, C8, C9,C10, C11	10 n	Capacitor	Murata	GRM155R71H103KA88
4	1	CN1	1x07 TH/S MD - 90°	Header		
5	2	CN2, CN3		Connector	FCI	10118192-0001LF
6	1	L1	2.2 nF/25 V/6 A	LC filter	Murata	NFE31PT222Z1E9L
7	1	LED1		Green LED	Rohm Semiconductor	SML-210MTT86
8	1	LED2		Red LED	Rohm Semiconductor	SML-210LTT86
9	2	R1, R2	560	Resistor		
10	9	R3, (R4 not mounted), R5, R6, R7, R9, R12, R16, R19, R21	0R0	Resistor		
11	1	R5	10 k	Resistor		
12	2	R11, R13	22 R	Resistor		
13	1	R15	15 k	Resistor		
14	1	R17	1 M	Resistor		
15	1	U1		LDO	ST	LD1117S25TR
16	1	U2		MCU	ST	STM32F103T8U6

5 Board assembly and layout

Figure 10: Board assembly

6   Revision history

Table 4: Document revision history

Date	Version	Changes
04-Aug-2016	1	Initial release.
21-Nov-2016	2	Updated Figure 1: "STEVAL-ISB038V1R evaluation board", Figure 8: "STEVAL-ISB038V1R RX circuit schematic", Table 2: "STEVAL-ISB038V1R (receiver board) bill of materials" and Figure 10: "Board assembly" Added Figure 9: "STEVAL-ISB038V1R USB-I²C dongle" and Table 3: "STEVAL-ISB038V1R (USB-I²C dongle) bill of materials"
05-Jan-2017	3	Updated Table 3: "STEVAL-ISB038V1R (USB-I²C dongle) bill of materials"
11-Apr-2017	4	Updated Table 2: "STEVAL-ISB038V1R (receiver board) bill of materials"
27-Jul-2017	5	Updated *Table 1: "STEVAL-ISB038V1R electrical performance"*

IMPORTANT NOTICE – PLEASE READ CAREFULLY