UM0894
User manual

STM32W-SK and STM32W-EXT starter and extension kits for STM32W108xx microcontrollers

Introduction

The STM32W-SK and STM32W-EXT starter and extension kits are easy to use tools for the STM32W108xx microcontrollers. This family of microcontrollers integrates a 32-bit ARM® Cortex™-M3 microprocessor and a 2.4 GHz, IEEE 802.15.4-compliant transceiver. The kits demonstrate how effectively the STM32W108xx can be used in real IEEE 802.15.4 applications. They are suitable for different types of wireless network scenarios such as:

- Remote control and target networks (based on the ZigBee RF4CE protocol stack) used for driving consumer devices such as TVs, set-top boxes, etc.
- Point to point networks (based on a Simplified MAC library) used to address a basic IEEE 802.15.4 communication. This configuration enables customers to develop any protocol stack of their choice.

The STM32W108xx kits provide demonstration applications and documentation which serve as a reference for creating your own applications and re-programming the STM32W108xx microcontroller. You can run the STM32W108xx kits in several ways (remote control/target and point-to-point applications), using the dedicated software libraries (ZigBee RF4CE, and Simplified MAC), as well as a third-party IDE and C compiler (IAR).

Moreover, the STM32W108xx kits provide a set of APIs which allow you to use the kit platform capabilities such as LEDs and serial communication channels (virtual COM through USB).

In this manual, you can find information about:

- The STM32W108xx kits components
- How to install the related hardware and software trees

Note: 1 The term “application board” refers to the MB851 and MB954 platforms.

2 For more information, visit the STM32W 32-bit RF microcontroller webpages at www.st.com/stm32w.

This web page provides full access to all the STM32W108xx resources (kits, software packages and documents).

Table 1 lists the evaluation tools concerned by this user manual.

Table 1. Applicable tools

Type	Applicable tools
Evaluation tools	STM32W-SK and STM32W-EXT starter and extension kits

Contents

1 **Getting started 6**

1.1 Kit description 6

1.1.1 Hardware 6

1.2 Revision numbers of STM32W108xx starter and extension kit boards . . . 8

1.3 MB850 hardware description 8

1.3.1 MB850 resources 8

1.3.2 MB850 connectors 9

1.3.3 MB850 connectors: JP1 pins 9

1.3.4 MB850 connectors: JP2 pins 9

1.3.5 MB850 jumper configuration 10

1.3.6 MB850 PC interface chip 10

1.3.7 MB850 battery holder 10

1.4 MB951 hardware description 10

1.4.1 MB951 resources 10

1.4.2 MB951 connectors 10

1.4.3 MB951 jumpers configuration 11

1.4.4 MB951 PC Interface chip 11

1.4.5 MB951 battery holder 11

1.5 MB851 hardware description 11

1.5.1 MB851 resources 11

1.5.2 MB851 connectors 12

1.5.3 MB851 connectors: P1 pins 12

1.5.4 MB851 connectors: P4 pins 13

1.5.5 MB851 jumper configuration 14

1.5.6 MB851 PC interface chip 14

1.5.7 MB851 battery holder 14

1.6 MB954 hardware description 14

1.6.1 MB954 resources 14

1.6.2 MB954 connectors 15

1.6.3 MB954 connectors: P1 pins 15

1.6.4 MB954 connectors: P4 pins 16

1.6.5 MB954 jumper configuration 17

1.6.6 MB954 PC interface chip 17

1.6.7 MB954 battery holder 17

1.7 Software . . . 17
1.8 Documentation . . . 18
1.9 Software libraries and demonstration applications . . . 18
1.10 Kit set-up . . . 18
1.10.1 Powering on the boards . . . 18
1.10.2 Installing drivers for USB virtual COM . . . 18
1.10.3 Setting up the application serial communication channel . . . 19

2 Running the STM32W108xx kits . . . 20
2.1 Installing the STM32W108xx kit software tree . . . 20
2.2 Remote control and virtual TV (based on RF4CE library) . . . 20
2.2.1 Run the remote control (RC) and virtual TV applications . . . 21
2.2.2 Use the remote control (RC) and virtual TV applications . . . 22
2.2.3 Use the virtual remote control (RC) and virtual TV applications . . . 22
2.3 Basic star network (based on SimpleMAC library) . . . 23
2.3.1 Run preloaded sample appl. on STM32-Primer2, MB850 platforms (only for STM32W108B-SK) . . . 23
2.3.2 Run the sample planet application on the application board . . . 24
2.3.3 Set up a star network using STM32-Primer2, MB850 platforms . . . 24
2.3.4 SimpleMAC Sun PC applet (based on SimpleMAC library) . . . 25
2.3.5 Run the SimpleMAC Sun PC applet . . . 25
2.3.6 Build, download and run the sample planet application on the application board . . . 27
2.3.7 Set up a star network using SimpleMAC Sun PC applet . . . 28

3 STM32W108xx kits utilities and software tools . . . 30
3.1 stm32w_flasher utility . . . 30
3.2 Network analyzer . . . 30
3.2.1 Perytons . . . 30
3.3 IAR Embedded Workbench® for ARM . . . 31

4 List of acronyms . . . 32

5 Available board schematics . . . 33

6 Revision history . . . 44

List of tables

Table 1. Applicable products and tools . . . 1
Table 2. Boards revision numbers . . . 8
Table 3. MB850 connectors . . . 9
Table 4. MB850 connectors: JP1 pins . . . 9
Table 5. MB850 connectors: JP2 pins . . . 9
Table 6. MB951 board resources to develop applications and connection . . . 10
Table 7. MB951 board connectors . . . 10
Table 8. PC interface chip . . . 11
Table 9. MB851 resources . . . 11
Table 10. MB851 connectors . . . 12
Table 11. MB851 connectors: P1 pins . . . 12
Table 12. MB851 connectors: P4 pins . . . 13
Table 13. MB851 jumper configuration . . . 14
Table 14. MB851 PC Interface chip . . . 14
Table 15. MB851 battery holder . . . 14
Table 16. MB954 resources . . . 14
Table 17. MB954 connectors . . . 15
Table 18. MB954 connectors: P1 pins . . . 15
Table 19. MB954 connectors: P4 pins . . . 16
Table 20. MB954 jumper configuration . . . 17
Table 21. MB954 PC interface chip . . . 17
Table 22. MB954 battery holder . . . 17
Table 23. Definition of LCD screen symbols (SimpleMAC sample application) . . . 25
Table 24. SimpleMAC Sun PC applet command options . . . 27
Table 25. List of acronyms used in the document . . . 32
Table 26. Document revision history . . . 44

List of figures

Figure 1. STM32W108B-SK starter kit . . . 7
Figure 2. STM32W108C-SK starter kit . . . 7
Figure 3. MB851 application board . . . 8
Figure 4. MB954 application board with a power amplifier . . . 8
Figure 5. RF4CETV PC applet . . . 21
Figure 6. RF4CE RC application driving the ST Virtual TV PC applet . . . 22
Figure 7. RF4CERC PC applet . . . 23
Figure 8. STM32-Primer2 sun node . . . 24
Figure 9. Planet device joined to the network . . . 24
Figure 10. Planet sends data to the sun . . . 24
Figure 11. Sun node with 5 planets . . . 25
Figure 12. Network down . . . 25
Figure 13. SimpleMAC Sun PC applet flash image check . . . 26
Figure 14. SimpleMAC Sun node forming an IEEE 802.15.4 network . . . 27
Figure 15. Planet device joined to the network . . . 28
Figure 16. Planet sends data to the sun . . . 28
Figure 17. Sun node with 5 planets . . . 29
Figure 18. MB850 rev. A . . . 33
Figure 19. MB851 module . . . 34
Figure 20. MB851 rev. A . . . 35
Figure 21. MB851 rev. B . . . 36
Figure 22. MB851 rev. C . . . 37
Figure 23. MB851 rev. D . . . 38
Figure 24. MB954 module . . . 39
Figure 25. MB954 rev. A . . . 40
Figure 26. MB954 rev. B . . . 41
Figure 27. MB954 rev. C . . . 42
Figure 28. MB951 rev. B . . . 43

1 Getting started

This section provides a complete description of the STM32W-SK and STM32W-EXT kit's hardware and software.

There are two types of STM32W108xx kits:

- The starter kit (order code: STM32W108C-SK)
- The extension kit (order code: STM32W108C-KEXT)

Note: 1. Order code STM32W108B-KEXT is replaced by STM32W108C-KEXT.

2. STM32W108C-SK and STM32W108C-KEXT contain STM32W108CC (256-Kbyte Flash).

3. STM32W108B-SK and STM32W108B-KEXT contain STM32W108xB (128-Kbyte Flash).

1.1 Kit description

1.1.1 Hardware

STM32W108B-SK

The STM32W108xx starter kit package (STM32W108B-SK) contains the following hardware components:

- Two STM32W108 application boards (MB851)
- One STM32W108 extension board (MB850)
- One Raisonance STM32-Primer2 tool (STM3210E-PRIMER)
- One J-Link Lite JTAG Flash programmer and debugger
- One mini USB cable
- Four AAA batteries

Figure 1. STM32W108B-SK starter kit



Network Analyzer (Perytons)



J-Link Lite + IAR compiler



MB851 application board x2



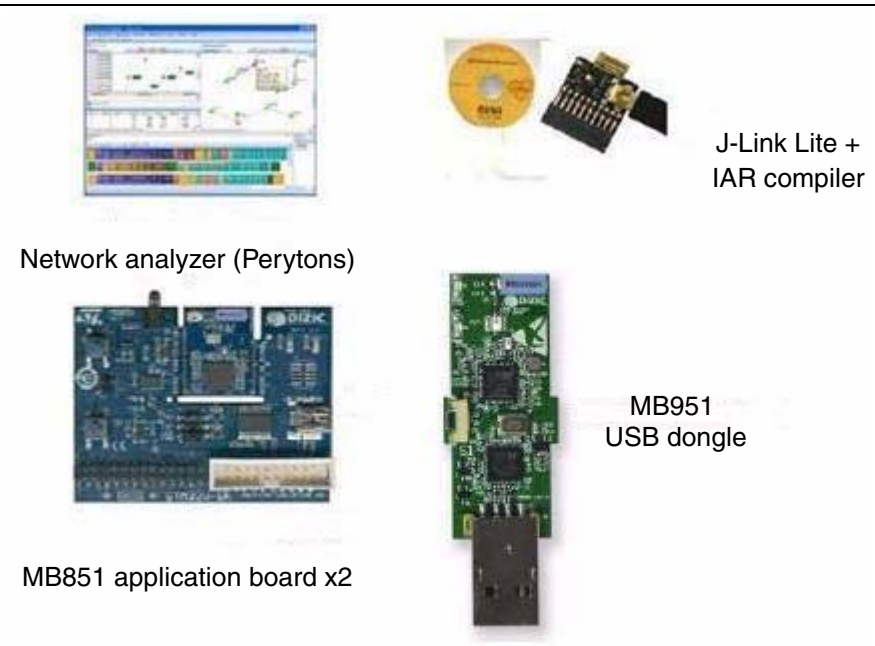
MB850 extension board + STM32-Primer2

STM32W108C-SK

The STM32W108xx starter kit package (STM32W108C-SK) contains the following hardware components:

- Two STM32W108 application boards (MB851)
- One STM32W108 USB Dongle (MB951)
- One J-Link Lite JTAG Flash programmer and debugger
- One mini USB cable
- Four AAA batteries

Figure 2. STM32W108C-SK starter kit



STM32W-EXT

The extension kit package contains two STM32W108 application boards (MB851) and two STM32W108 application boards with a power amplifier (MB954).

Figure 3. MB851 application board

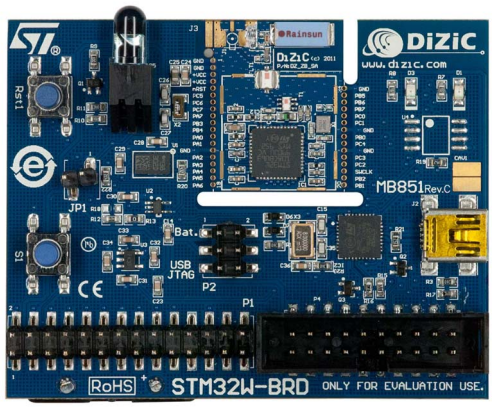
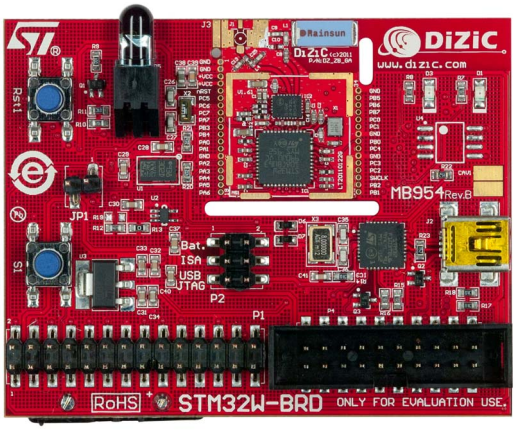


Figure 4. MB954 application board with a power amplifier



Note: For information concerning the STM32W108xx application boards, refer to the STM32W 32-bit RF microcontroller webpages at www.st.com/stm32w.

1.2 Revision numbers of STM32W108xx starter and extension kit boards

Table 2 details the STM32W108xB starter and extension kit board revision numbers versus those of the STM32W108CC.

Table 2. Boards revision numbers

	STM32W108xB (128K Flash)	STM32W108CC (256K Flash)
MB851	Revision A, B, C	Revision D
MB954	Revision A, B	Revision C
MB951	NA	Revision B
MB850	Revision A	NA

NA = Not applicable

1.3 MB850 hardware description

1.3.1 MB850 resources

None

1.3.2 MB850 connectors

Table 3 lists the connectors available in the MB850 board and their functions.

Table 3. MB850 connectors

Type	Label	Function
Header 6H	JP1	SWD debug
Header 10X2	JP2	Connector to Primer2 board

1.3.3 MB850 connectors: JP1 pins

Table 4. MB850 connectors: JP1 pins

Pin number	GPIO/ Function
1	+2V8
2	GND
3	PC0/JRST
4	SWCLK/JTCK
5	PC4/SWDIO/JTMS
6	nRST

1.3.4 MB850 connectors: JP2 pins

Table 5. MB850 connectors: JP2 pins

Pin number	GPIO/ Function
1	+2V8
2	GND
3	NC
4	NC
5	PA0
6	PA1
7	PA2
8	PA3
9	NC
10	NC
11	nRST
12	PA5
13	NC
14	PB4
15	PB3

Table 5. MB850 connectors: JP2 pins (continued)

Pin number	GPIO/ Function
16	PB2
17	NC
18	PB1
19	NC
20	GND

1.3.5 MB850 jumper configuration

None

1.3.6 MB850 PC interface chip

None

1.3.7 MB850 battery holder

None

1.4 MB951 hardware description

1.4.1 MB951 resources

Table 6 lists the resources available in the MB951 board to develop applications and their connection with STM32W108 pins.

Table 6. MB951 board resources to develop applications and connection

Type	Label	Part	Rev B
			STM32W108 pin
Button	S1		PA3
LED	D1		PA5
LED	D3		PA0

Note: MB951 revision A is not used in any of the STM32W108xx starter and extension kits.

1.4.2 MB951 connectors

Table 7 lists the connectors available in the MB951 board and their functions.

Table 7. MB951 board connectors

Type	Label	Function
USB	P1	PC I/O

1.4.3 MB951 jumpers configuration

None

1.4.4 MB951 PC Interface chip

Table 8 lists the PC interface chip available in the MB951 board to allow I/O interface to the STM32W108.

Table 8. PC interface chip

Type	Part
PC I/O interface	STM32F103TBU6

1.4.5 MB951 battery holder

None

1.5 MB851 hardware description

1.5.1 MB851 resources

Table 9 lists the resources available in the MB851 board to develop applications and their connection with STM32W108 pins.

Table 9. MB851 resources

Type	Label	Part	Rev A	Rev B	Rev C, D
			STM32W108 pin		
Button	RST1				
Button	S1		PA7	PA7	PB3
I²C EEPROM	U4	M24C64MW1 128 KBytes	NA	NA	PA1, PA2
LED	D1		PB6	PB6	PA5
LED	D3		PB5	PB5	PA0
LED	D5	Infrared LED	PB4	PB4	PB4
Mems	U2	LIS302	PA1, PA2	PA1, PA2	PA1, PA2
Temperature sensor	U3	STLM20	PB7	PB7	PA4

1.5.2 MB851 connectors

Table 10 lists the connectors available in the MB851 board and their functions.

Table 10. MB851 connectors

Type	Label	Function
Mini USB	J2	PC I/O
Header, 14-pin, dual row male	P1	GPIO access
Header, 10-pin, dual row male	P4	Standard JTAG debug

1.5.3 MB851 connectors: P1 pins

Table 11. MB851 connectors: P1 pins

Pin number	GPIO function
1	+VBRD
2	PC5
3	nRST
4	PA7
5	PB3
6	PB4
7	PA0
8	PA1
9	PA2
10	PA4
11	PA3
12	PA6
13	PA5
14	GND
15	PB1
16	PB2
17	JTCK
18	PC2
19	PC3
20	PC4
21	GND
22	GND
23	PB0
24	PC1

Table 11. MB851 connectors: P1 pins (continued)

Pin number	GPIO function
25	PC0
26	PB7
27	PB6
28	PB5

1.5.4 MB851 connectors: P4 pins

Table 12. MB851 connectors: P4 pins

Pin number	GPIO function
1	+VBRD
2	+VBRD
3	PC0
4	GND
5	PC3
6	GND
7	PC4
8	GND
9	JTCK
10	GND
11	GND
12	GND
13	PC2
14	GND
15	nRST
16	GND
17	GND
18	GND
19	+VJTAG
20	GND

1.5.5 MB851 jumper configuration

Table 13 lists the jumpers configurations on the MB851 board.

Table 13. MB851 jumper configuration

Label	Configuration
JP1	Power Mems, temperature sensor and infrared LED
P2	1-2: battery powered
	2-3: reserved
	3-4: USB or JTAG powered

1.5.6 MB851 PC interface chip

Table 14 lists the PC interface chip available in the MB851 board to allow I/O interface to the STM32W108.

Table 14. MB851 PC Interface chip

Revision	Type	Part
Rev. A	PC I/O	FTDI FT232R
Rev. B	PC I/O	FTDI FT232R
Rev. C, D	PC I/O	STM32F103TBU6

1.5.7 MB851 battery holder

Table 15. MB851 battery holder

Type	Label
2x AAA battery holder	BT1

1.6 MB954 hardware description

1.6.1 MB954 resources

Table 16 lists the resources available in the MB954 board to develop applications and their connection with STM32W108 pins.

Table 16. MB954 resources

Type	Label	Part	Rev. A	Rev. B, C
			GPIO	GPIO
Button	RST1			
Button	S1		PB3	PB3

Table 16. MB954 resources (continued)

Type	Label	Part	Rev. A	Rev. B, C
			GPIO	GPIO
I²C EEPROM	U4	M24C64MW1 128 KBytes	Not fitted	PA2
LED			PA5	PA5
LED	D3		PA0	PA0
LED	D5	Infrared LED	PB4	PB4
Mems	U2	LIS302	PA1, PA2	PA1, PA2
Temperature sensor	U3	STLM20	PA4	PA4

1.6.2 MB954 connectors

Table 17 lists the connectors available in the MB954 board and their functions.

Table 17. MB954 connectors

Type	Label	Function
Mini USB	J2	PC I/O
Header, 14-pin, dual row male	P1	GPIO access
Debug connector	P4	Standard JTAG debug

1.6.3 MB954 connectors: P1 pins

Table 18. MB954 connectors: P1 pins

Name	GPIO function
1	+VBRD
2	PC5
3	nRST
4	PA7
5	PB3
6	PB4
7	PA0
8	PA1
9	PA2
10	PA4
11	PA3
12	PA6
13	PA5
14	GND
15	PB1

Table 18. MB954 connectors: P1 pins (continued)

Name	GPIO function
16	PB2
17	JTCK
18	PC2
19	PC3
20	PC4
21	GND
22	GND
23	PB0
24	PC1
25	PC0
26	PB7
27	PB6
28	PB5

1.6.4 MB954 connectors: P4 pins

Table 19. MB954 connectors: P4 pins

Name	GPIO function
1	+VBRD
2	+VBRD
3	PC0
4	GND
5	PC3
6	GND
7	PC4
8	GND
9	JTCK
10	GND
11	GND
12	GND
13	PC2
14	GND
15	nRST
16	GND
17	GND
18	GND
19	+VJTAG
20	GND

1.6.5 MB954 jumper configuration

Table 20 lists the jumpers configurations in the MB954 board.

Table 20. MB954 jumper configuration

Label	Configuration
JP1	Power Mems, temperature sensor and infrared LED
P2	1-2: battery powered
	2-3: reserved
	3-4: USB or JTAG powered

1.6.6 MB954 PC interface chip

Table 21 lists the PC interface chip available in the MB954 board to allow I/O interface to the STM32W108.

Table 21. MB954 PC interface chip

Revision	Type	Part
Rev. A	PC I/O	FTDI FT232R
Rev. B, C	PC I/O	STM32F103TBU6

1.6.7 MB954 battery holder

Table 22. MB954 battery holder

Type	Part
2x AAA battery holder	BT1

1.7 Software

STM32W-SK

The starter kit package contains the following software components:

- One CD-ROM including Perytons™ network analyzer.
- One CD-ROM including the IAR™ Limited 30-days Evaluation Compiler.

Note: STM32W108B-SK also contains one CD-ROM including the RaisonanceTM Development Suite for the STM32-Primer2.

STM32W-EXT

No CDs are delivered with the extension kit package.

1.8 Documentation

The starter kit package STM32W-SK contains the following documentation components:

- STM32W108 starter kit welcome letter which briefly describes the kits targets and components.

Note: STM32W108B-SK also contains Raisonance STM32-Primer2 welcome letter.

The extension kit package STM32W-EXT contains an STM32W108 extension kit welcome letter which briefly describes the kits targets and components.

1.9 Software libraries and demonstration applications

The STM32W108xx Starter and Extension Kit boards supports the following RF Software libraries packages:

- ST ZigBee RF4CE software library and ZRC, ZID application profiles with demonstration applications for controlling an RF4CE compliant TV using an RF4CE compliant remote control and a RF4CE mouse, keyboard, ...
- ST SimpleMAC software library and demonstration applications targeting point-to-point communication scenarios based on the IEEE 802.15.4 protocol.

For a detailed description of each software package, refer to the related documentation.

Note: Please check for the most recent RF library package versions on the STM32W 32-bit RF MCUs Internet webpages at www.st.com/stm32w.

1.10 Kit set-up

1.10.1 Powering on the boards

Each application board can be powered as follows:

- Via batteries (fit 1-2 on the P2 jumper)
- Via USB or JTAG (fit 5-6 on the P2 jumper)

Note: 1. The jumper position 3-4 is reserved for internal usage.

2. To enable the application board temperature, MEMS and infrared sensors, fit jumper JP1.

3. MB951 USB dongle can be powered only by connecting it to a PC USB port.

The MB850 extension board is designed as an IEEE 802.15.4 application-specific daughterboard. It must be connected to the STM32-Primer2 extension connector to be powered through the STM32-Primer2. The MB850 should be connected with the STM32W108 visible.

1.10.2 Installing drivers for USB virtual COM

In order to use the serial communication channel on an application board, a driver for the FTDI USB<-> Serial converter or a Virtual COM port driver for an STM32F103xx must be installed. The correct driver to install is based on the application board revision number.

The following application boards requires the driver FTDI USB <-> Serial converter:

- MB851 Rev A
- MB851 Rev B
- MB954 Rev A

The related drivers can be downloaded from the FTDI website at www.ftdichip.com/Drivers/D2XX.htm.

All other application boards require the STMicroelectronics Virtual COM port driver which is provided within each RF software library package.

1.10.3 Setting up the application serial communication channel

To get full access to all the available commands, some demonstration applications may require that the application board is interfaced with the user through a serial communication channel (virtual COM through USB). To set a serial communication channel for the application board, follow these steps:

1. Where applicable, fit the application board jumper P2 on position 5-6 (power via USB).
2. Connect a mini USB cable to the application board mini-USB connector and to a PC USB port.
3. Right-click on **My Computer**, select **Manage**, **Device Manager**, and open **Ports** (COM & LPT) to display the related USB COMx port.
4. Open a hyper terminal on the corresponding USB virtual COMx port with the following configuration:
   - Bit rate: 115200
   - Data bits: 8
   - Parity: None
   - Stop bits: 1
   - Flow control: None

The STM32-Primer2 and MB850 demonstration applications use the STM32-Primer2 resources (LCD, joystick with button, touch screen display) as I/O communication channels.

2 Running the STM32W108xx kits

STM32W-SK

In the STM32W-SK starter kit (STM32W108B-SK), the following applications are preprogrammed:

- Two CircleOs applications preloaded in the STM32-Primer2:
  - ZigBee RF4CE RC application
  - SimpleMAC sun sample application
- One Perytons capture firmware (application board labeled as “Analyzer”)

In the STM32W-SK starter kit (STM32W108C-SK), the following applications are preprogrammed:

- One SimpleMAC planet application (application board labeled as "Planet")
- One Perytons capture firmware (application board labeled as “Analyzer”)
- A USB dongle with SimpleMAC planet application

You can also start a packet capture session using the Perytons analyzer (see *Section 3.2: Network analyzer* for more details).

STM32W-EXT

In the STM32W-EXT extension kit, all four boards are preprogrammed with SimpleMAC planet firmware (application board labeled as "Planet").

Using these boards, you can extend the sun, planet point to point network with other four planet nodes.

2.1 Installing the STM32W108xx kit software tree

To install the specific kit software tree, download the related RF software library package from the STM32W 32-bit RF MCUs Internet web pages.

2.2 Remote control and virtual TV (based on RF4CE library)

This section shows how to control a ZigBee RF4CE-compliant TV target using an RF4CE-compliant remote control. The demonstration application is run using the STM32-Primer2 and MB850 as a remote control and a PC applet for emulating a TV on your PC.

The RF4CETV PC applet implements a virtual TV supporting the following features:

- 12 channels, playing video from files
- Volume control
- Mute
- Channel change
- Play/Pause
- Pair button
- Device information

Note: STM32- Primer2 and MB850 are available only with STM32W108B-SK kit.

2.2.1 Run the remote control (RC) and virtual TV applications

The STM32-Primer2 tool provided with the STM32W-SK starter kit (only STM32W108B-SK) is delivered with the RC application. This application automatically configures the connected MB850 extension board with the related ZigBee RF4CE RC application.

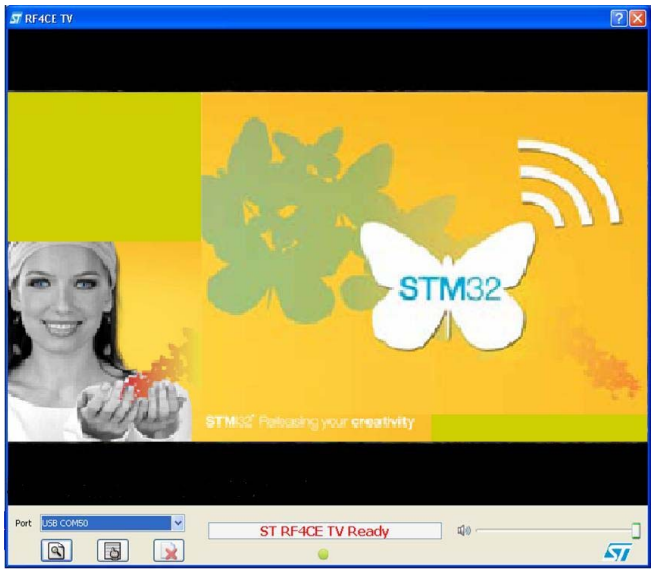
The application board is automatically configured when launching the RF4CETV PC applet.

To run the RC and TV applications on the STM32 Primer2, MB850 and application board platforms, the following steps are required:

1. Connect the MB850 to the extension connector of the STM32-Primer2 tool.
2. Power on your STM32-Primer2.
3. Press the joystick button to launch the Main Menu and select Applic.->RF4CE RC.
   If everything is properly done, the LCD screen displays a set of RF4CE RC commands.
4. Connect the application board to the PC using a mini USB cable with P2 fitted in position 5-6 (power from USB). A virtual COM port should appear in the Windows Device Manager.
5. From Windows, launch the RF4CETV.exe PC applet. A PC applet GUI appears.
6. Select the serial port matching the port assigned by the Windows Device Manager. If the firmware on the application board is not present, the application uploads the firmware through the serial port. Wait until LED D1 is on.
7. Push the button  to start pairing with the RF4CE remote control. LED D1 starts blinking quickly when the node is ready for pairing (for 30 sec.).
8. On your STM32-Primer2, use the joystick to scroll between button pages until you find the button . Push the button to start pairing with the application board.

If everything is properly done, a message on your STM32-Primer2 screen and in the RF4CETV applet informs you that the pairing process has been successful.

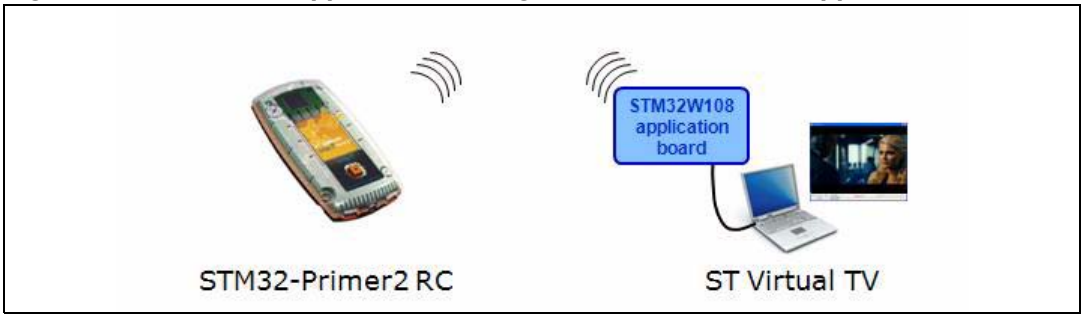
Figure 5. RF4CETV PC applet



2.2.2 Use the remote control (RC) and virtual TV applications

To send an RC command to the virtual TV, push the associated RC symbol on the STM32-Primer2 touch sensing screen.

Figure 6. RF4CE RC application driving the ST Virtual TV PC applet



Note: For further information about the ST RF4CE demonstration applications, refer to the STM32W108xx ZigBee RF4CE library user manual (UM0909).

2.2.3 Use the virtual remote control (RC) and virtual TV applications

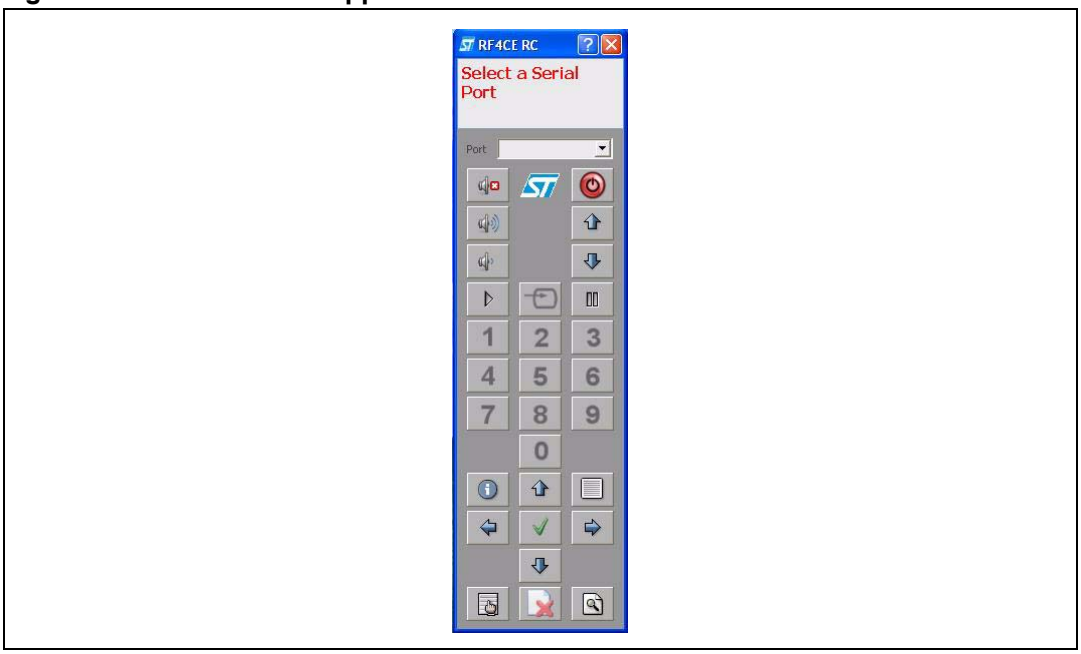
The same demonstration application can be run using the ST virtual remote control (RC) PC applet.

The RF4CERC PC applet implements a virtual RC supporting the following features:

- Certain RC standard buttons
- Volume control
- Mute
- Channel change
- Pair button
- Paired device information

Click on **From Windows** to launch the RF4CERC.exe PC applet. A PC applet GUI appears.

Figure 7. RF4CERC PC applet



Push the button  *to start pairing with the ST Virtual TV and then use the RC buttons to drive the virtual TV.*

2.3 Basic star network (based on SimpleMAC library)

This section shows how to set up a star network supporting parent and child roles (called, respectively, sun and planet).

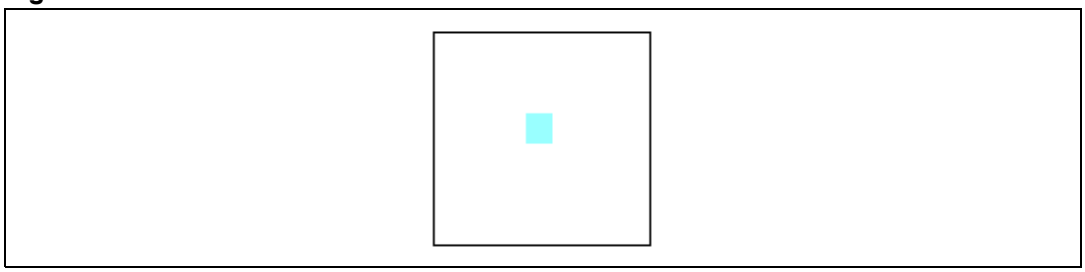
2.3.1 Run preloaded sample appl. on STM32-Primer2, MB850 platforms (only for STM32W108B-SK)

The STM32-Primer2 tool provided with the STM32W-SK starter kit is delivered with a sample application (sun image). This application automatically configures the connected MB850 extension board with the related sample application.

To run the sample application on the STM32-Primer2, MB850 platforms, follow these steps:

1. Connect the MB850 to the extension connector of the STM32-Primer2 tool.
2. Power on your STM32-Primer2.
3. Press the joystick button to launch the main menu and select Applic.->SM SUN.
   If everything is done properly, you get an LCD screen showing a light blue box in the center. This blue box represents the sun node (a network has been created).

Figure 8. STM32-Primer2 sun node



4. Press the button again to access the application main menu. This is the first level option list. Options can be classified in two categories:
   - Options that provide information about the sun parameters (node information, planets list)
   - Options that execute actions (leave network, quit)

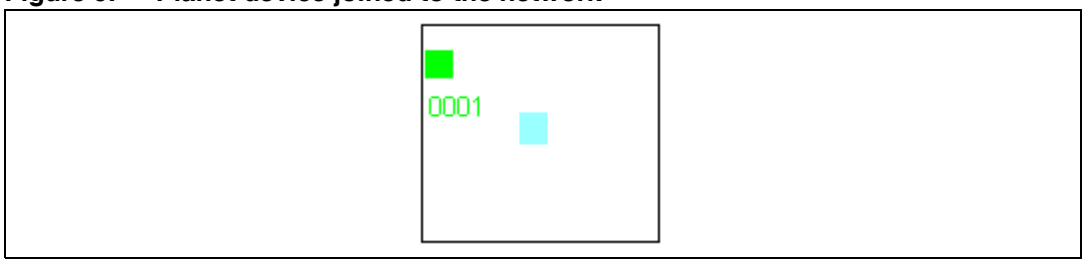
2.3.2 Run the sample planet application on the application board

To download and run the sample planet application on an application board, use the related IAR project provided within the SimpleMAC software library package following the instructions described in *Section 3.3: IAR Embedded Workbench® for ARM*.

2.3.3 Set up a star network using STM32-Primer2, MB850 platforms

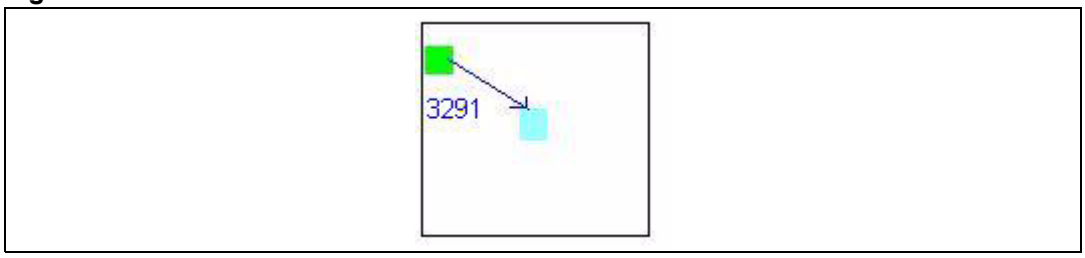
On the planet node, press button S1 to join the network formed by the STM32-Primer2 sun node. Once joined, the planet LED D3 turns on and the planet node is displayed on the STM32-Primer2's LCD (as a green box with the related 2-byte short address underneath).

Figure 9. Planet device joined to the network



When a planet device sends data to the sun device (at a periodic rate), a blue line connecting the transmitting planet to the sun is displayed on the screen as well as the sent application board VDD_PADS value (in mV).

Figure 10. Planet sends data to the sun



This identifies which planet is in transmission mode if there is more than one planet device (up to 5 supported by the STM32-Primer2 sun application).

Figure 11. Sun node with 5 planets

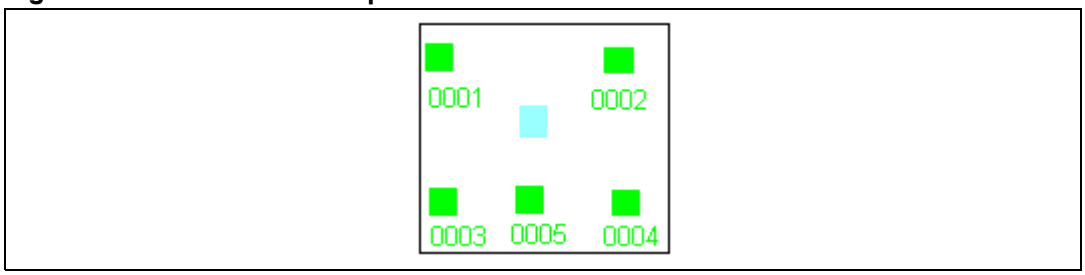
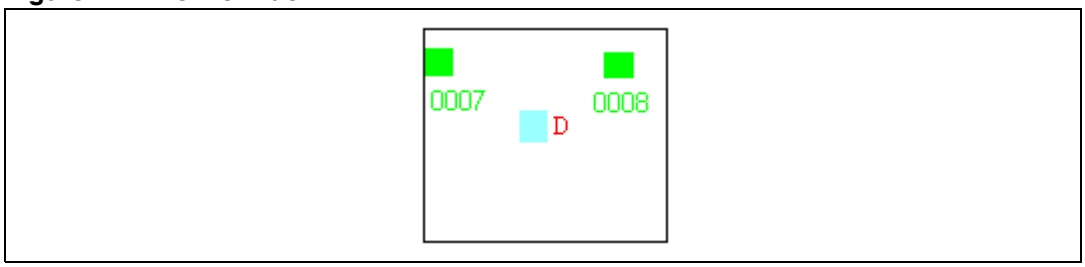


Figure 12. Network down



The following table summarizes the symbols appearing on the LCD screen and the associated events.

Table 23. Definition of LCD screen symbols (SimpleMAC sample application)

Symbol	Associated event
Blue line connecting planet to sun	Planet sends data to the sun (see *Figure 10*)
D	Network down (see *Figure 12*)

Note: For further information about the SimpleMAC sample application, refer to STM32W108xx SimpleMAC user manual - UM0893, available on the STM32W 32-bit RF microcontroller webpages at www.st.com/stm32w.

2.3.4 SimpleMAC Sun PC applet (based on SimpleMAC library)

This section shows how to set up a star network supporting parent and child roles (called, respectively, sun and planet) by using a PC applet targeting the SimpleMAC Sun application.

The main functions of the SimpleMAC Sun PC applet are:

- Sun node forms a IEEE 802.15.4 network
- Give all information about the sun node (channel, pan ID, node ID, eui64, tx power, ...)
- Handling planets nodes joining to the network
- Handling planets node leaving the network once
- Sun node leaves network
- Sun node receives data from each joined planet node

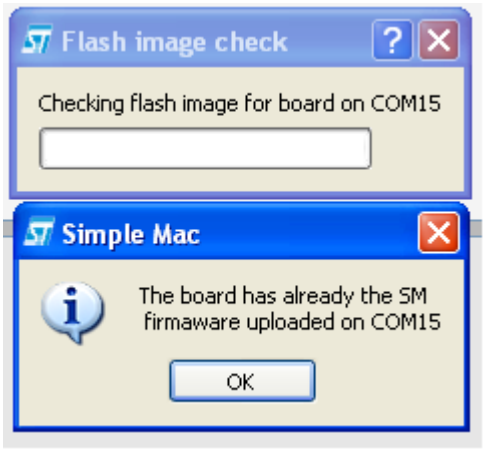
2.3.5 Run the SimpleMAC Sun PC applet

The application board is automatically configured when launching the SimpleMAC Sun PC applet.

To run the SimpleMAC Sun PC applet on an application board, the following steps are required:

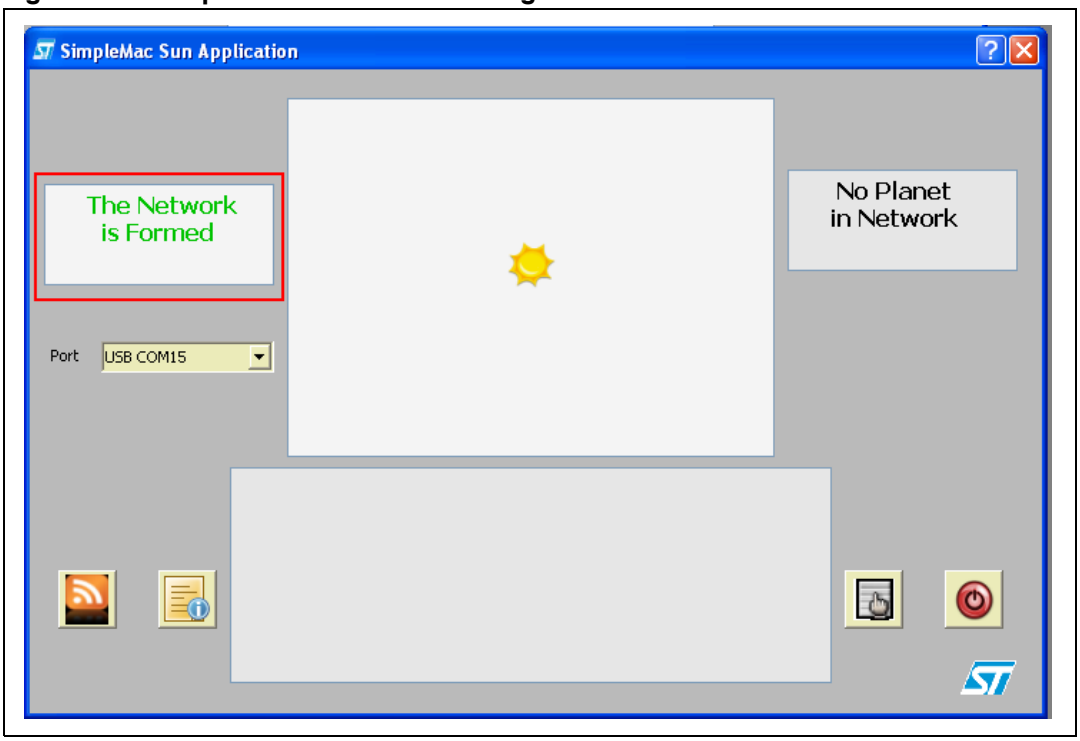
1. Connect the application board to the PC using a mini USB cable with P2 fitted in position 5-6 (power from USB). A virtual COM port should appear in the Windows Device Manager (or connect the USB dongle directly to a PC USB port).
2. From Windows, launch the SimpleMAC Sun Application.exe PC applet. A PC applet GUI appears.
3. Select the serial port matching the port assigned by the Windows Device Manager. If the firmware on the application board is not present, the application uploads the firmware through the serial port.

Figure 13. SimpleMAC Sun PC applet flash image check



4. Push the button  to let the sun node form a network. If everything is done properly, you get the following picture:

Figure 14. SimpleMAC Sun node forming an IEEE 802.15.4 network



The SimpleMAC Sun PC applet is also offering these command options:

Table 24. SimpleMAC Sun PC applet command options

Command	Description
	Display all information about the sun node
	Display a table giving information about planets
	It allows the sun node to leave the network

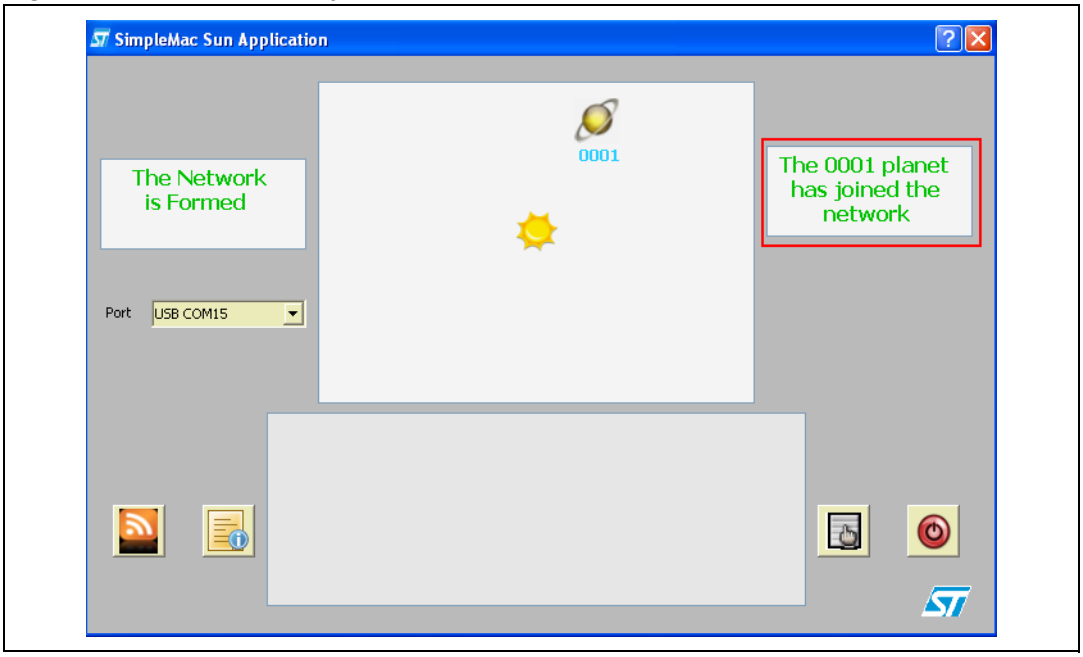
2.3.6 Build, download and run the sample planet application on the application board

To build, download and run the sample planet application on an application board, use the related IAR project provided within the SimpleMAC software library package following the instructions described in *Section 3.3: IAR Embedded Workbench® for ARM*.

2.3.7 Set up a star network using SimpleMAC Sun PC applet

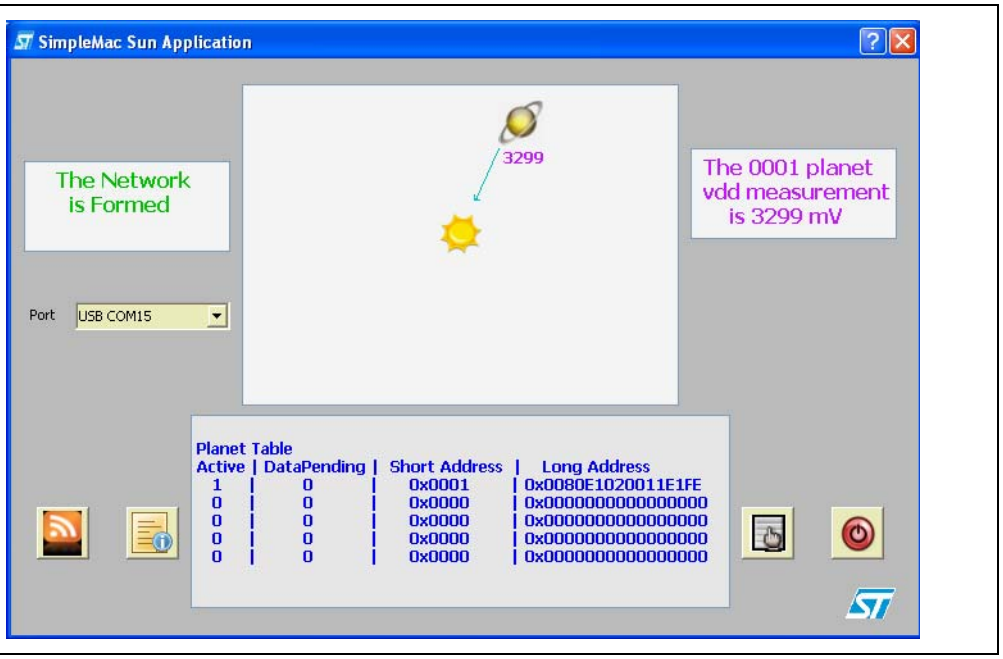
On the planet node, press button S1 to join the network formed by the STM32W108xx sun node. Once joined, the planet node is displayed on the SimpleMAC Sun PC applet.

Figure 15. Planet device joined to the network



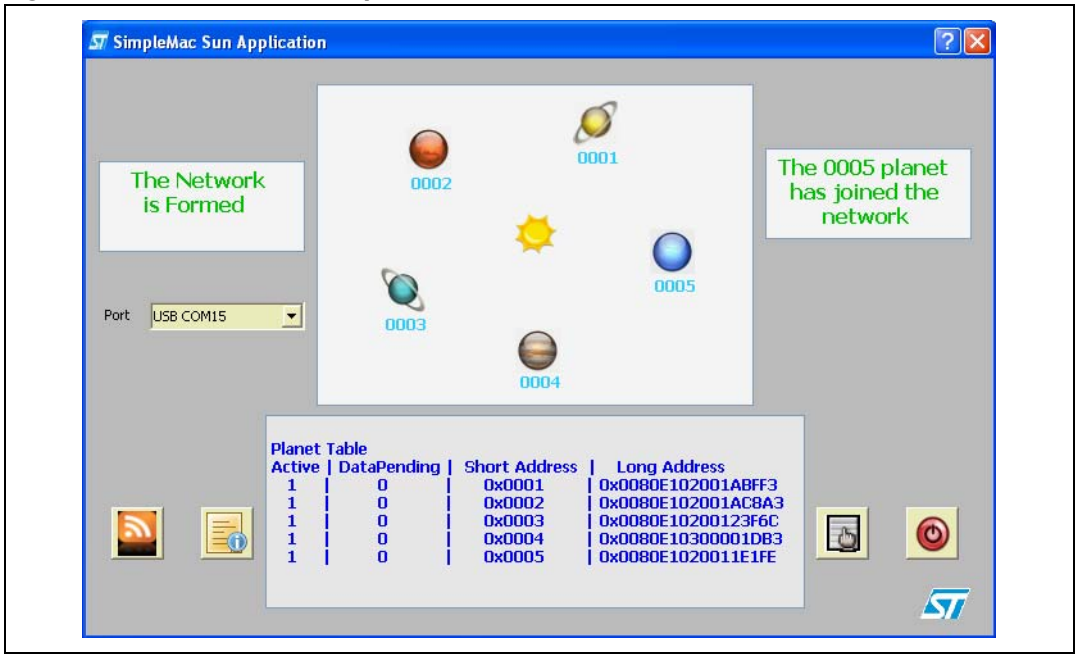
When a planet device sends data to the sun device (at a periodic rate), a line connecting the transmitting planet to the sun is displayed on the SimpleMAC Sun PC applet as well as the sent application board VDD_PADS value (in mV).

Figure 16. Planet sends data to the sun



This identifies which planet is in transmission mode if there is more than one planet device (up to 5 supported by the SimpleMAC Sun PC applet).

Figure 17. Sun node with 5 planets



Note: For further information about the SimpleMAC sample application, refer to the STM32W108xx SimpleMAC user manual - UM0893, available on the STM32W 32-bit RF microcontroller webpages at www.st.com/stm32w.

3 STM32W108xx kits utilities and software tools

3.1 stm32w_flasher utility

The stm32w_flasher utility allows you to download a binary file into the STM32W108xx application board. This utility comes with each RF software library package. To download a binary image, follow these steps:

1. Where applicable, fit the application board jumper P2 on position 5-6 (power via USB).
2. Connect a mini USB cable to the application board mini-USB connector and to a PC USB port.
3. Using the mouse, right-click on **My Computer**, select **Manage**, **Device Manager**, and open **Ports** (COM & LPT) to display the related USB COMx port.
4. Open a DOS Window on your PC.
5. Go to the utilities folder which comes after the installation process.
6. Type the following command: stm32w_flasher –p <COMx> -r –f <file_name.bin/.s37>

where COMx is the virtual COM related to the connected application board, and file_name.bin/.s37 is the application image to be downloaded.

Note: You can also use the stm32w_flasher utility through the JTAG programmer for all the boards which have a JTAG connector:

1. Fit the application board jumper P2 on position 5-6 (power via JTAG).
2. Plug the JTAG programmer to a PC USB port and to the board JTAG connector P4.
3. Open a DOS Window on your PC.
4. Go to the folder where the stm32w_flasher is located (tool or utility folder).
5. Type the following command: stm32w_flasher -f <file_name.bin/.s37> -r

3.2 Network analyzer

3.2.1 Perytons

To install the Perytons network analyzer, insert the related CD-ROM and follow the installation instructions. To use the Perytons network analyzer, follow these steps:

1. Application board labeled as “Analyzer“: fit jumper P2 on position 5-6 (power via USB) and connect to a PC USB port.
2. Open the Perytons tool (from Start, Programs).
3. For instructions about how to start a packet capture session, refer to the documentation on the Perytons CD-ROM.

When a packet capture session is ongoing, the application board LEDs behave as follows:

- When data is sent to the PC, LED D1 flashes for a short period.
- LED D3 is the heartbeat LED.

A prebuilt analyzer binary image for Perytons is provided with each RF software library package.

3.3 IAR Embedded Workbench® for ARM

To install the IAR Embedded Workbench® for ARM, follow these steps:

1. Go to the Download section of the IAR website (www.iar.com) download section and select a 30-day IAR version for ARM.
2. Start the download procedure and receive a 30-day license.
3. Insert the STM32W108 Starter Kit IAR CD-ROM and follow the installation instructions using the 30-day licence from the IAR website.

To build the binary image of all the available demonstration applications using the IAR tool, follow these steps:

1. Open the IAR tool.
2. From the File > Open > Workspace menu, open the *.eww IAR project related to the demonstration application you are going to address.
3. From the Project menu, select **Rebuild All**. A binary file is built under the project folder specified in Project > Options > General Options Category > Output menu > Executables/libraries item.

To download the built binary image on the application board, follow these steps:

1. Connect the JTAG Flash programmer to the application board P4 connector and to a PC USB port (through a USB cable).
2. Power the application board through the JTAG: P2 jumper fitted on 5-6 position.
3. From the Project menu, select Download and Debug. The binary image is downloaded into the STM32W108xx Flash.
4. From the Project menu, select Stop Debugging. The application is ready to run.

Note: To use the J-Link Lite JTAG Flash programmer, you need to switch on the "power supply for target" feature. The first time you plug the J-Link Lite on a PC USB port, follow these steps (make sure that you have already installed the IAR Embedded Workbench):

1. Open a DOS Window on your PC.
2. Type jlink.
3. Issue the command: power on perm.

4 List of acronyms

Table 25. List of acronyms used in the document

Term	Meaning
API	Application programming interfaces
ZRC	ZigBee Remote Control
ZID	ZigBee Input Device
MAC	Medium access control
PA	Power amplifier
RC	Remote control
RF	Radio frequency communication
USB	Universal serial bus

5 Available board schematics

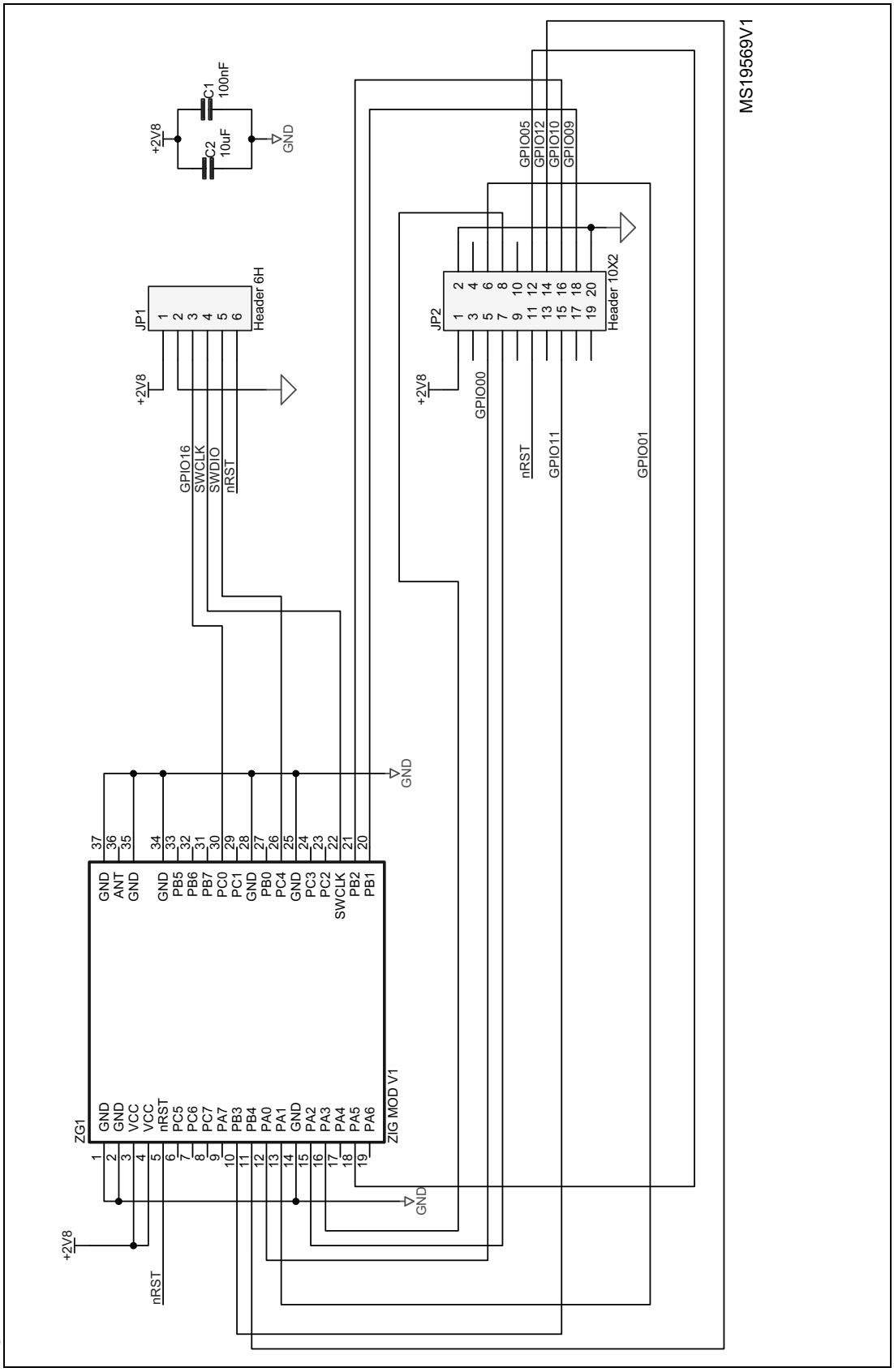


Figure 18. MB850 rev. A

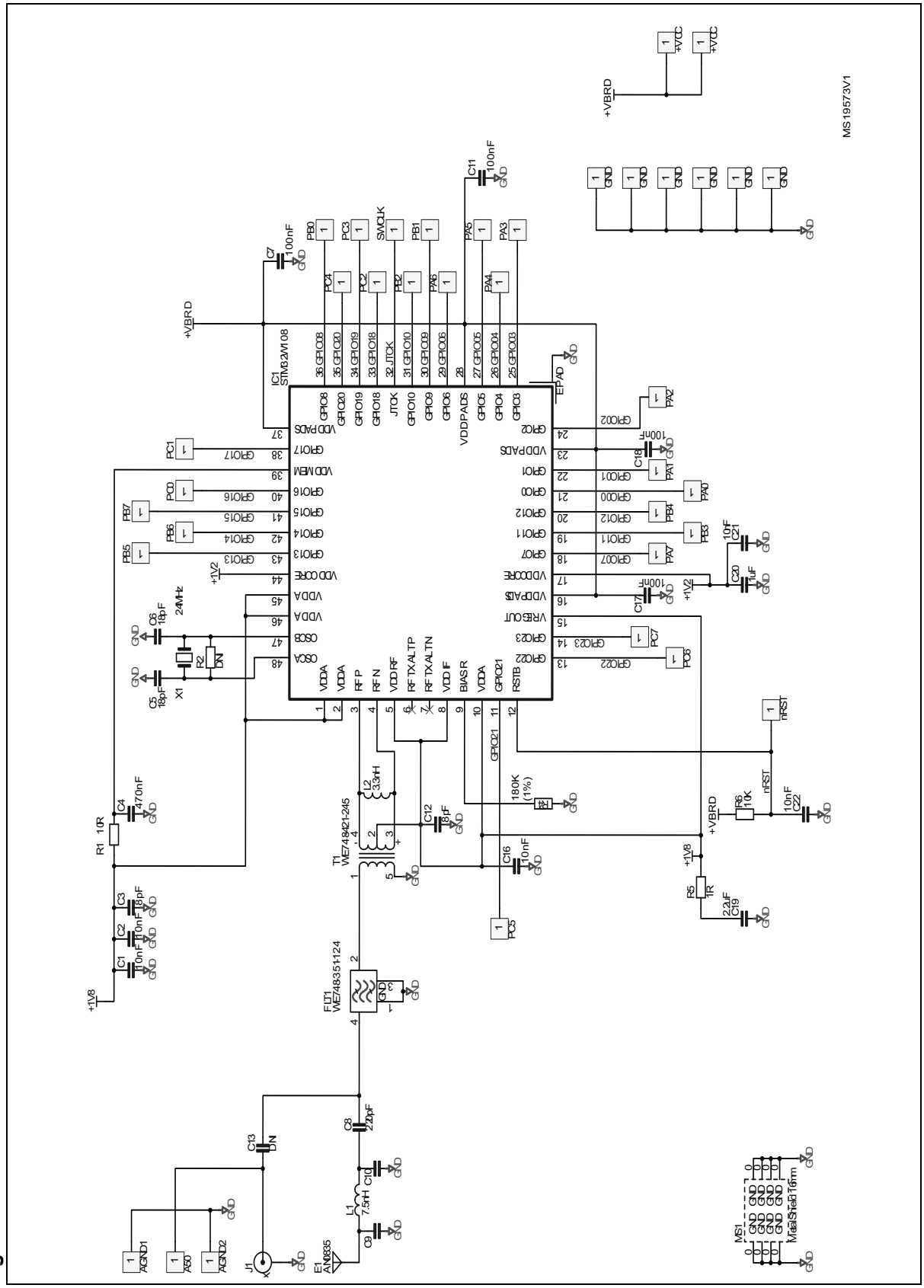


Figure 19. MB851 module

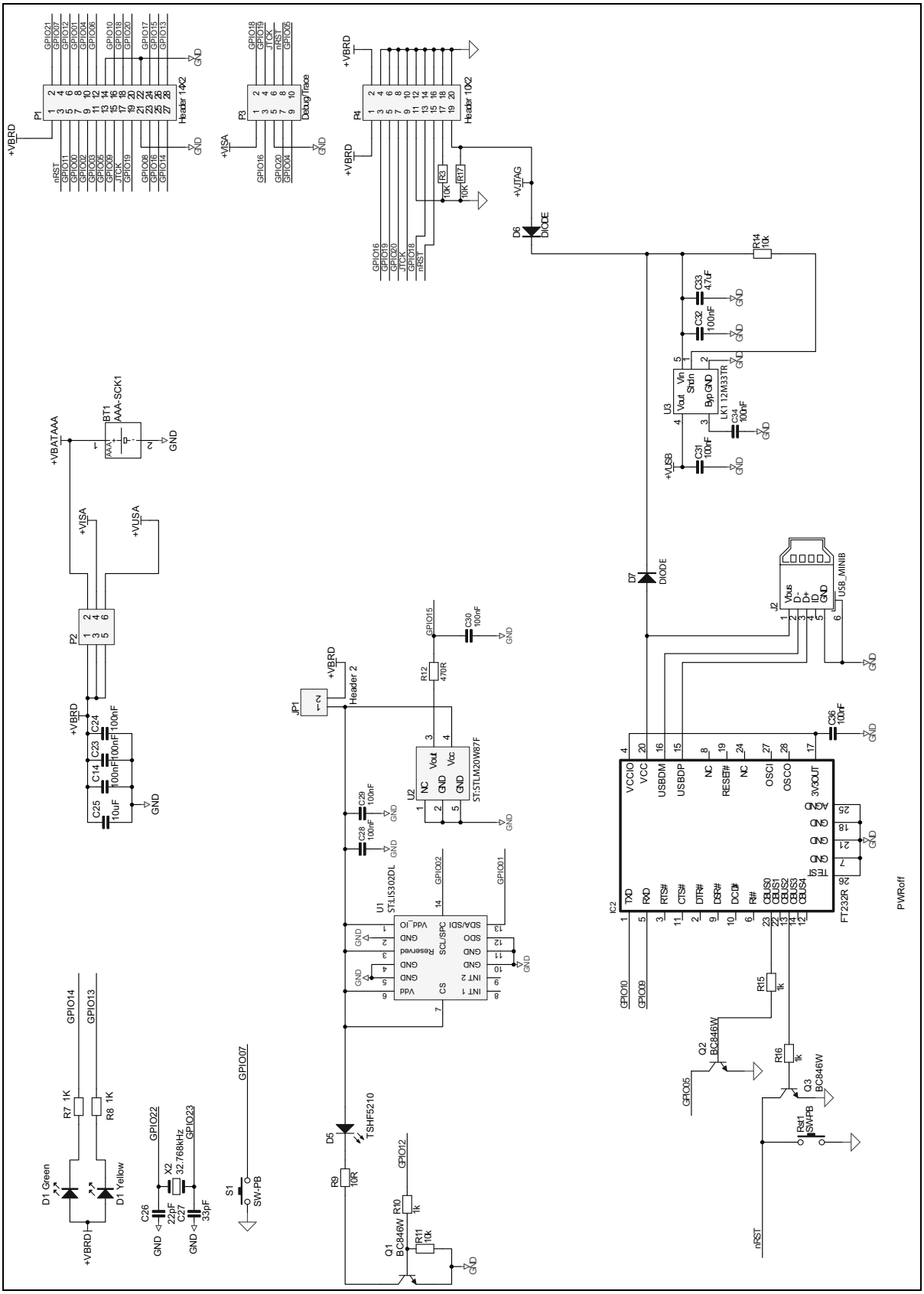


Figure 20. MB851 rev. A

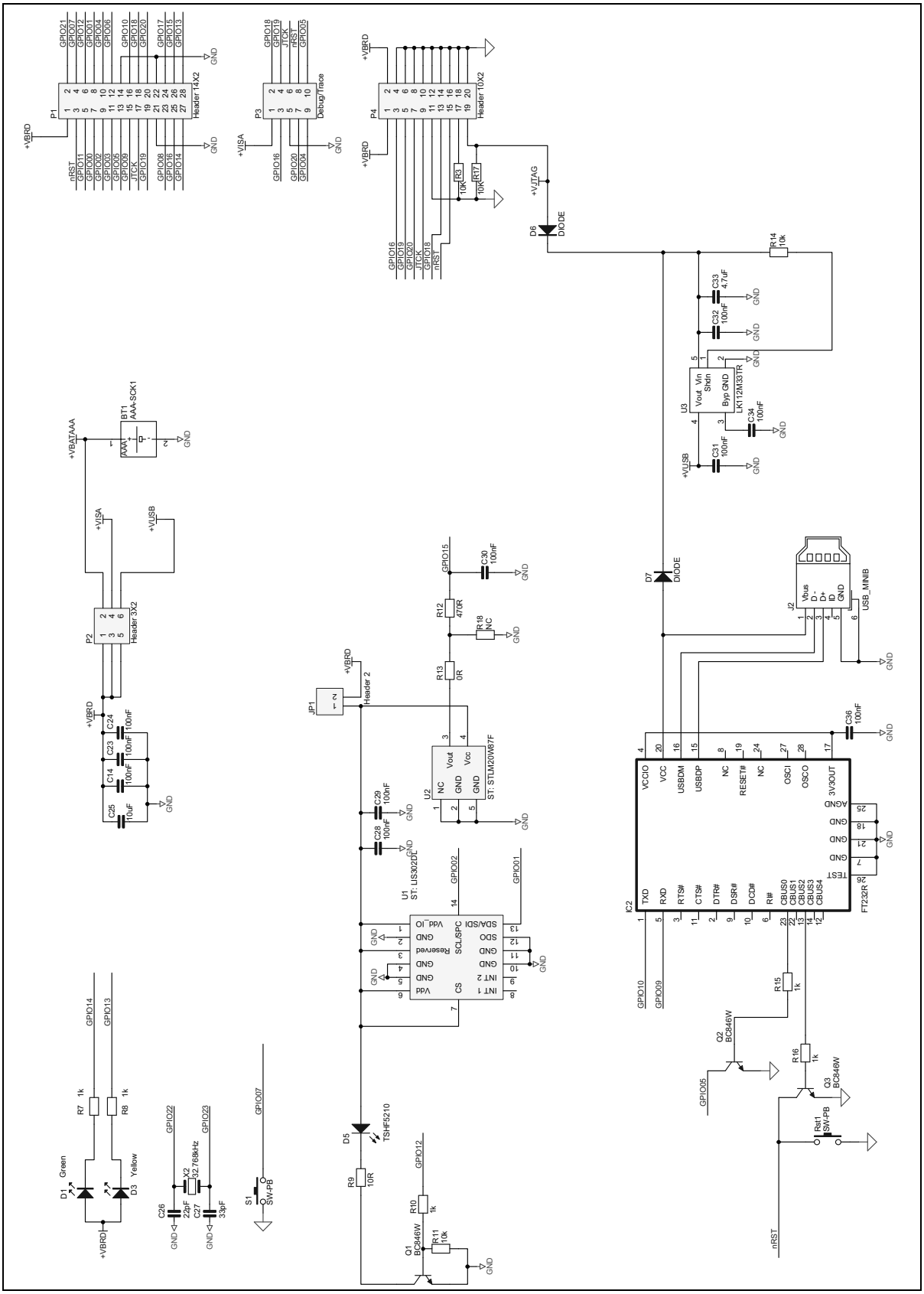


Figure 21. MB851 rev. B

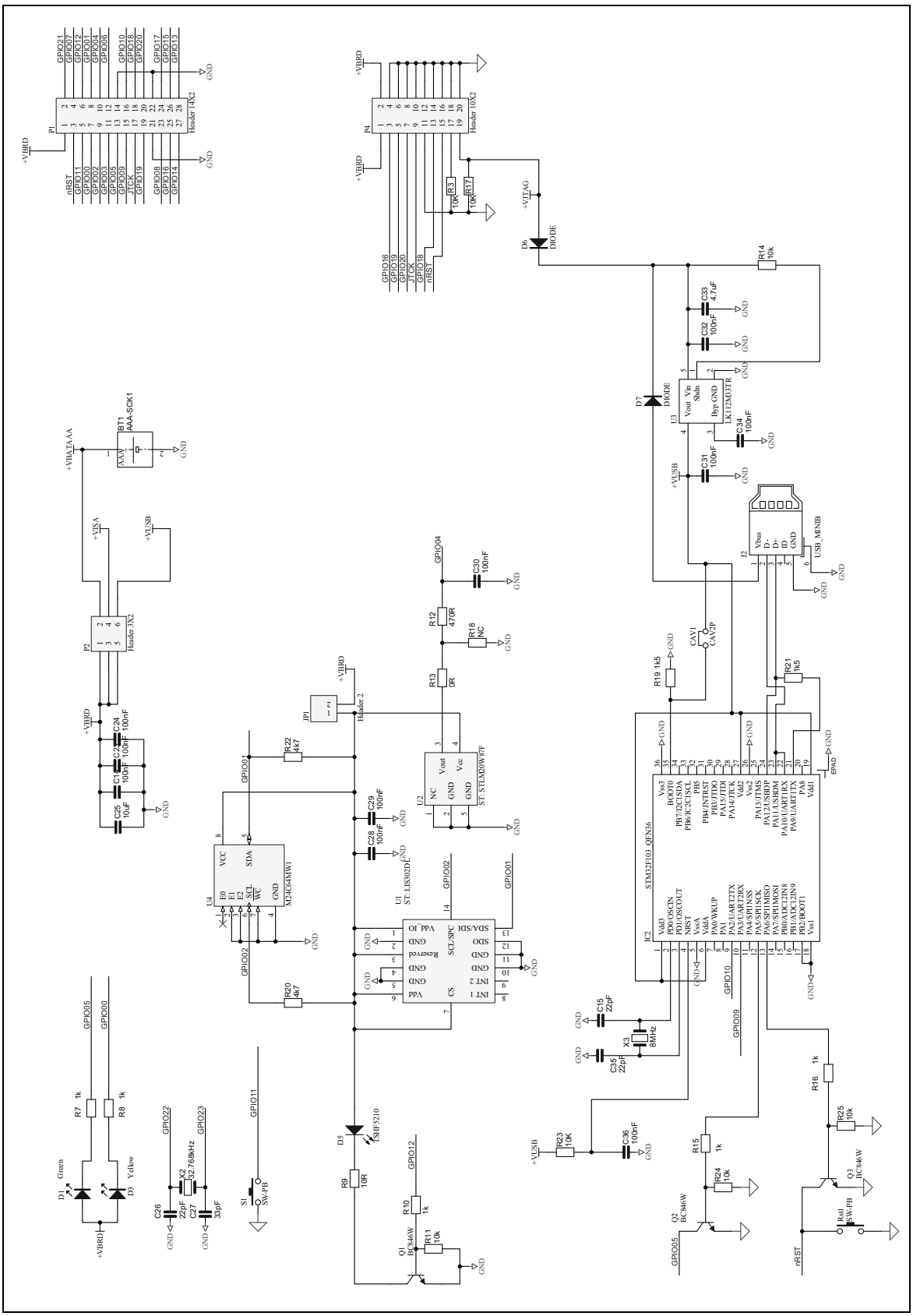


Figure 22. MB851 rev. C

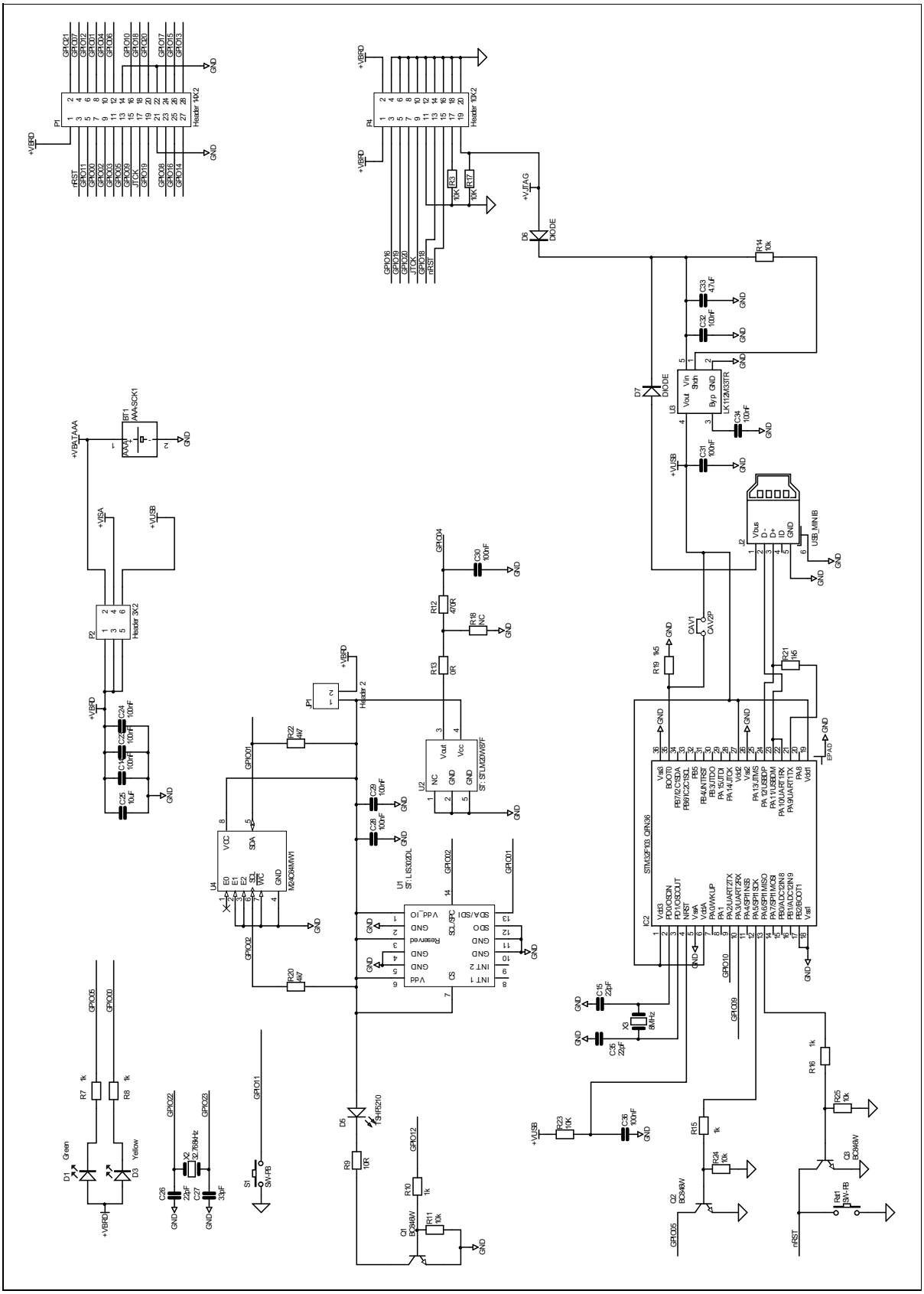


Figure 23. MB851 rev. D

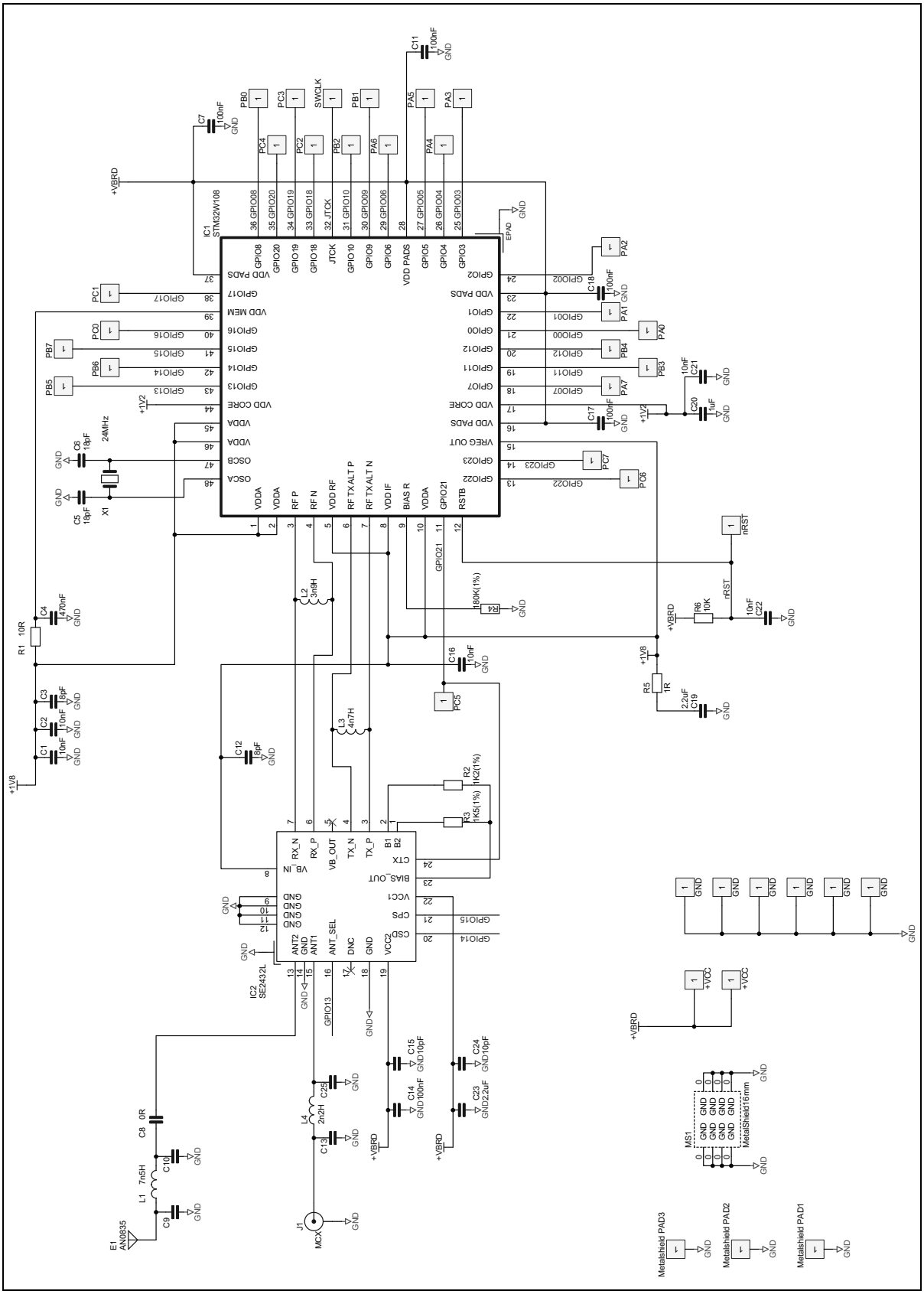


Figure 24. MB954 module

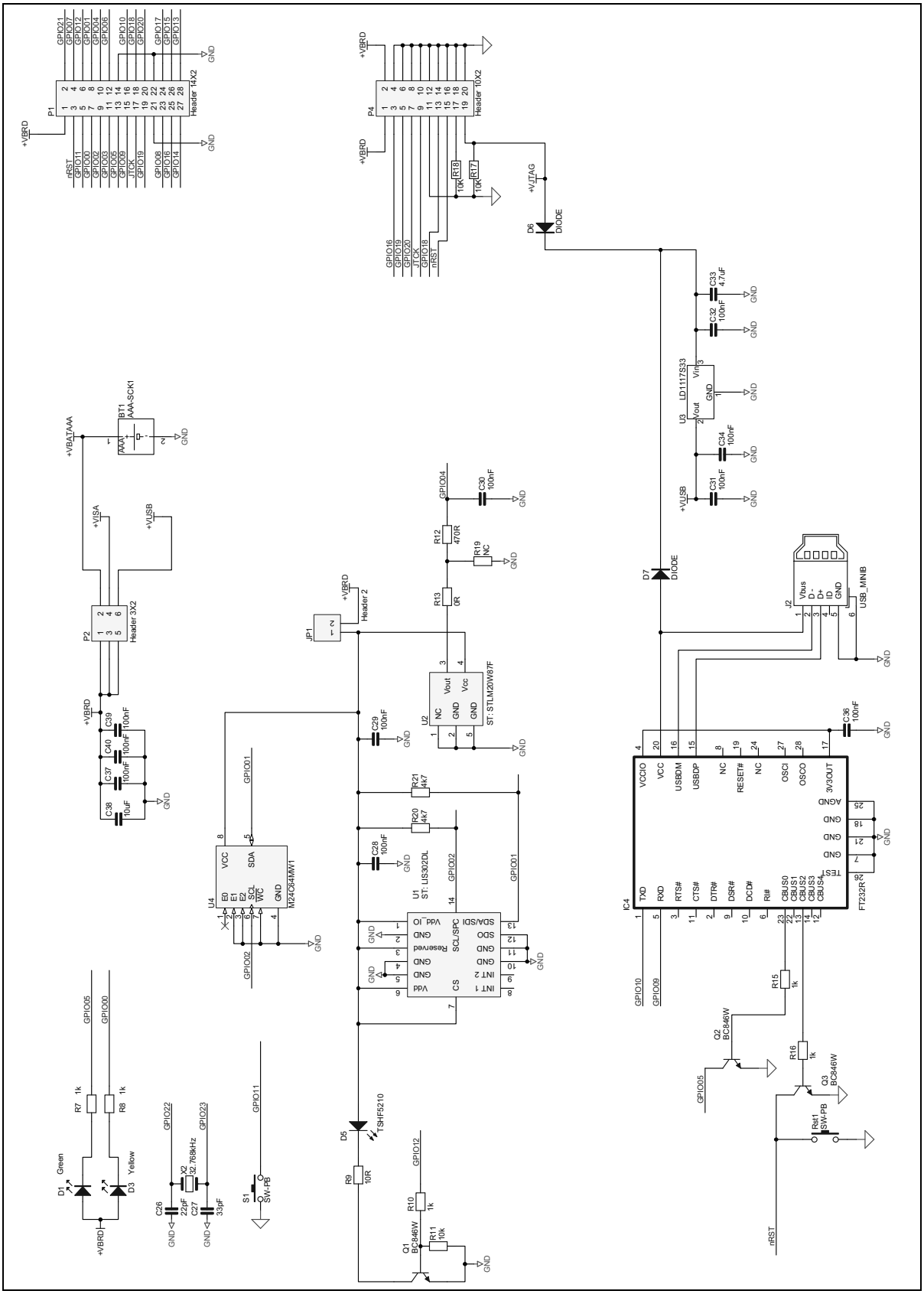


Figure 25. MB954 rev. A

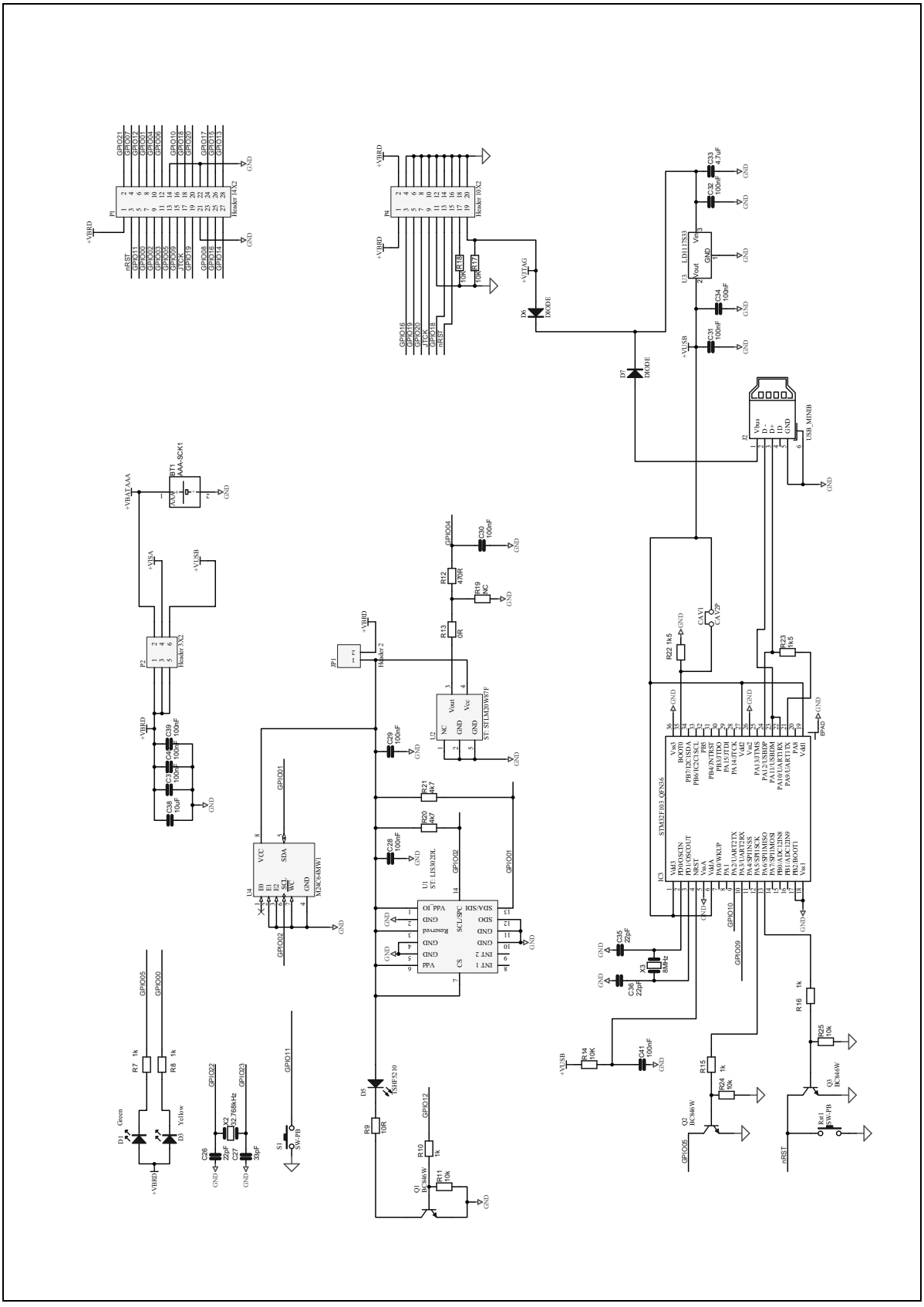


Figure 26. MB954 rev. B

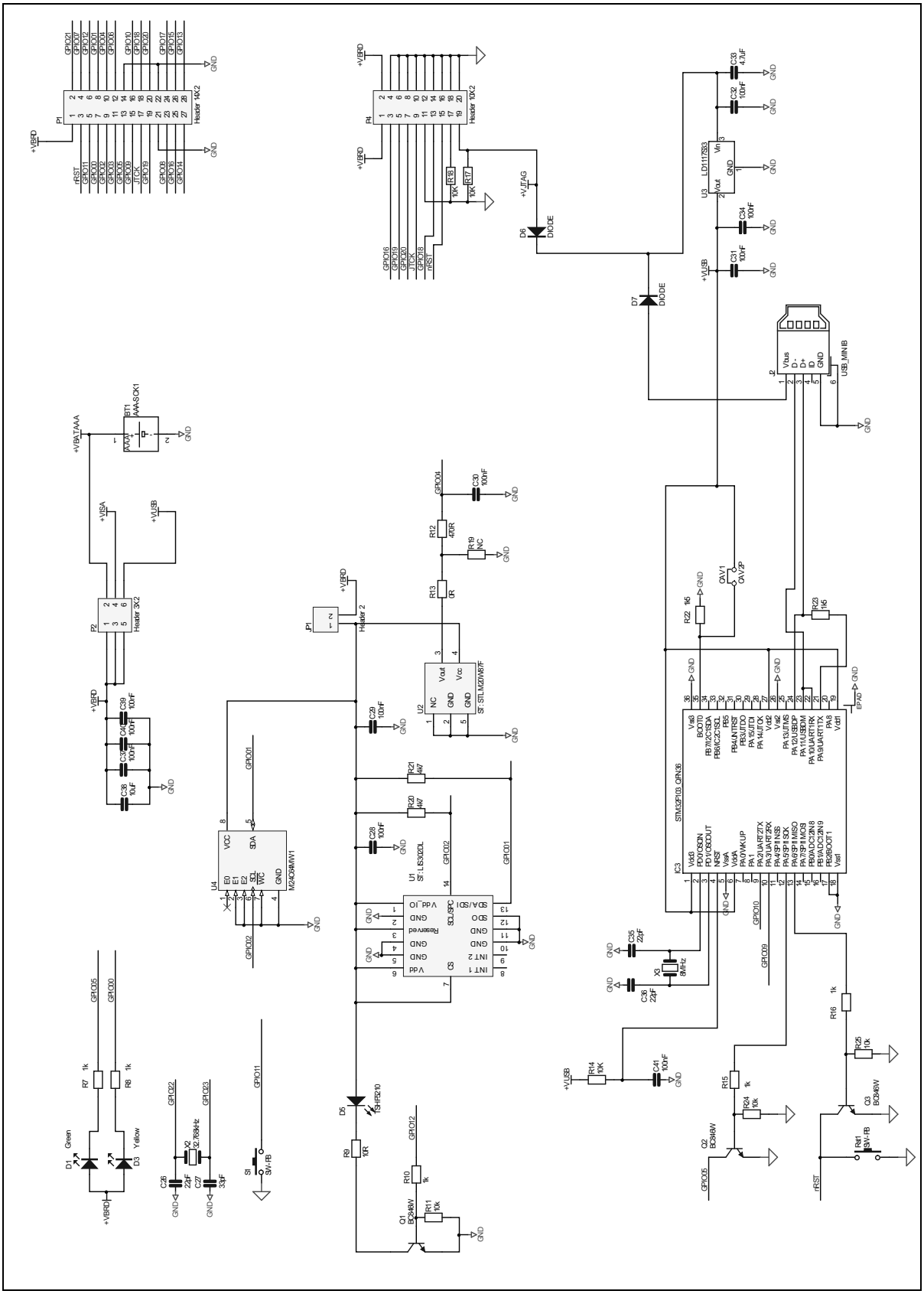


Figure 27. MB954 rev. C

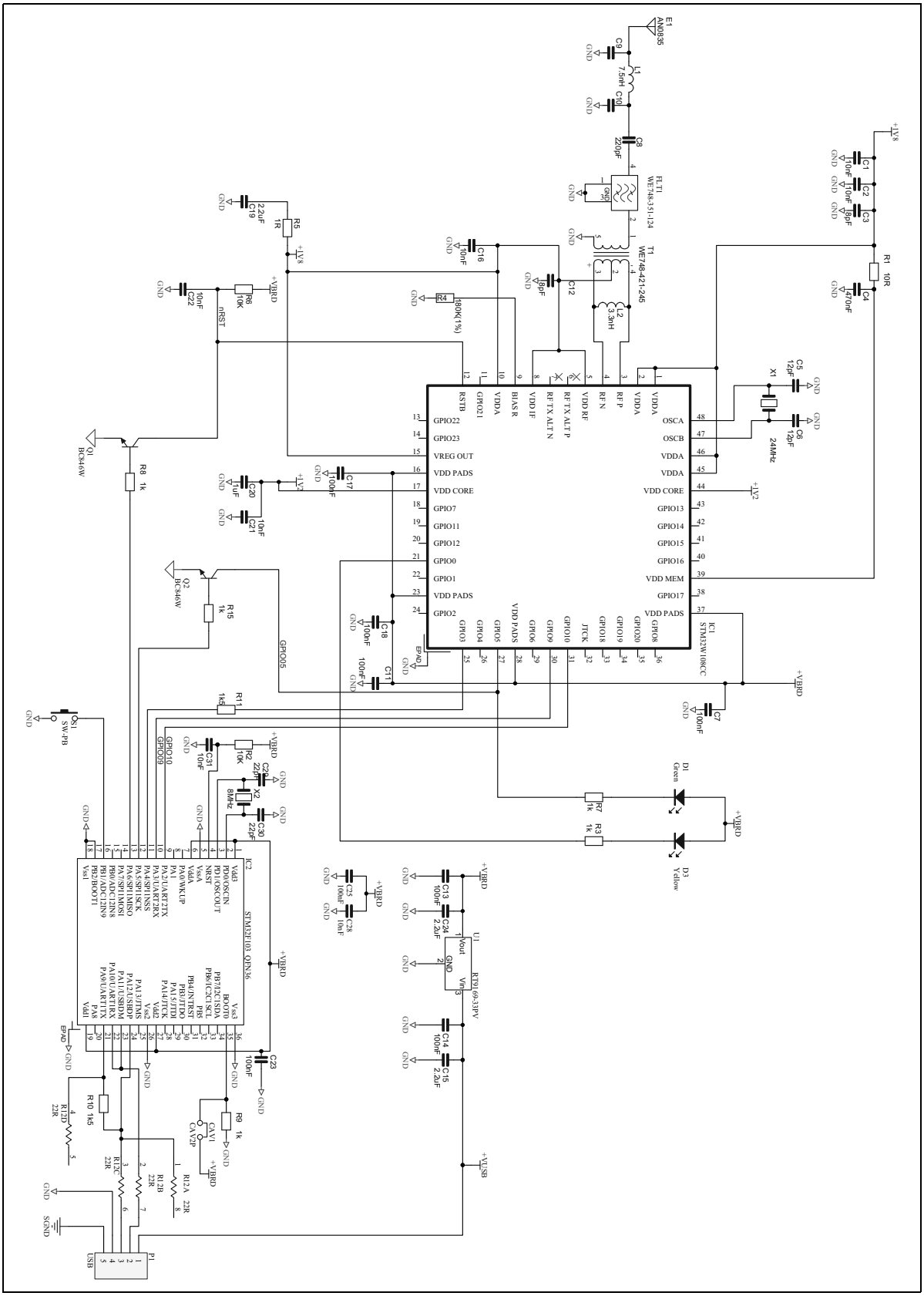


Figure 28. MB951 rev. B

6 Revision history

Table 26. Document revision history

Date	Revision	Changes
05-Feb-2010	1	Initial release.
21-Apr-2010	2	Modified software component versions in *Section 1.7*. Modified installer files in *Section 1.9*. Modified Parity to 1 in *Section 1.10.3*. Modified *Section 2.2.2*, *Section 2.2.3*, *Section 2.3.3*. Inserted *Section 3.4*.
08-Feb-2011	3	Added reference to MB954 application board with power amplifier (PA) delivered with latest generation of the STM32W108xx extension kit.
21-Jun-2011	4	Added *Section 5: Available board schematics* Changed *Figure 3: MB851 application board* and *Figure 4: MB954 application board with a power amplifier* Added *Section 1.3: MB850 hardware description* Added *Section 1.5: MB851 hardware description* Added *Section 1.6: MB954 hardware description*
25-May-2012	5	Removed reference to EmberZnet 4.3.0 ZigBee PRO package. Added new MB851 and MB954 board schematics.
03-Aug-2012	6	Added reference to the new STM32W108C-SK starter kit components. Added reference to the new SimpleMAC Sun PC applet. Added *Figure 28: MB951 rev. B* board schematics.

Please Read Carefully:

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST’s terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

UNLESS OTHERWISE SET FORTH IN ST’S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS EXPRESSLY APPROVED IN WRITING BY TWO AUTHORIZED ST REPRESENTATIVES, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER’S OWN RISK.

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2012 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Philippines - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com