



Introduction

The SPIRIT1 is a very low-power RF transceiver, intended for RF wireless applications in the sub-1 GHz band. It is designed to operate both in the license-free ISM and SRD frequency bands at 169, 315, 433, 868 and 915 MHz.

This application note reports the modifications in the PCB schematic and in the SPIRIT1 configuration to increase the output power in transmission mode, the maximum output power achievable and the related current consumption measurements in the ISM frequency bands.

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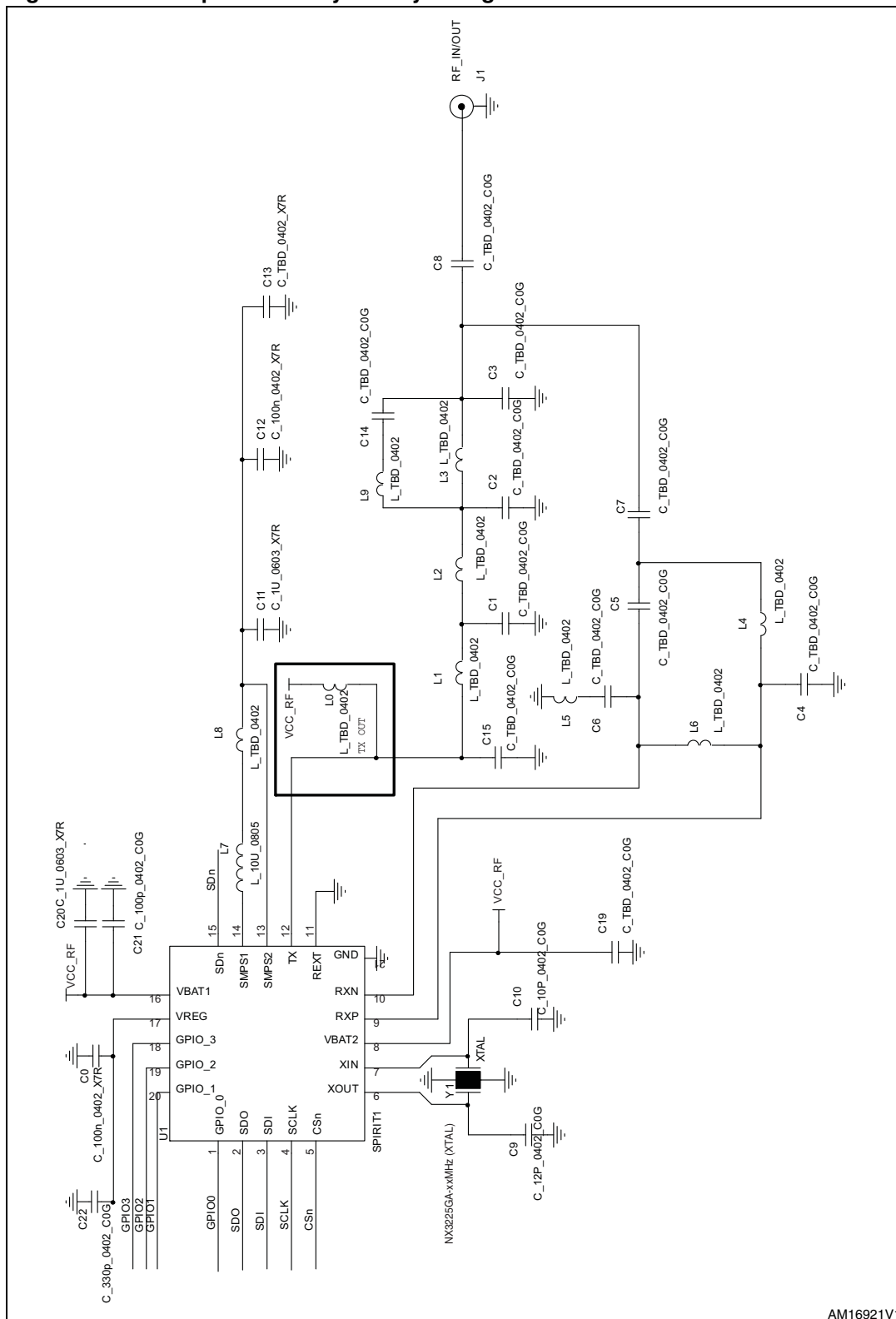
1 Application circuit

The SPIRIT1 integrates a switched mode power supply (SMPS) regulator allowing operation from a battery voltage ranging from +1.8 V to +3.6 V. With power conversion efficiency of at least 80%, the SMPS saves current consumption in the active mode.

In the default configuration the transmitter power amplifier (PA) output (pin 12 of the SPIRIT1) is biased by the 1.4V SMPS voltage output through the L0 external inductor ([Figure 1](#)). This limits the maximum output power at about +11 dBm, measured at the 50 Ohm connector via the reference design.

Biasing the PA output through the inductor L0 directly connected to the battery, instead of the SMPS output (as shown in [Figure 2](#)) allows the maximum output power delivered at the 50 ohm connector (or at the antenna) to be increased. The maximum output power changes with the voltage level applied at the PA output. [Section 2](#) reports the maximum output power achievable changing the voltage level in each ISM sub-band.

Figure 2. PA output biased by battery voltage



AM16921V1

2 Maximum output power

All the measurements here reported are performed at room temperature. The output power of the wanted emission, as well as the unwanted emission and the harmonics level, is delivered at the 50 Ohm single-ended load via the reference design.

The voltage supply V_{BAT} feeds the SPIRIT1, as well as the PA output (*Figure 2*).

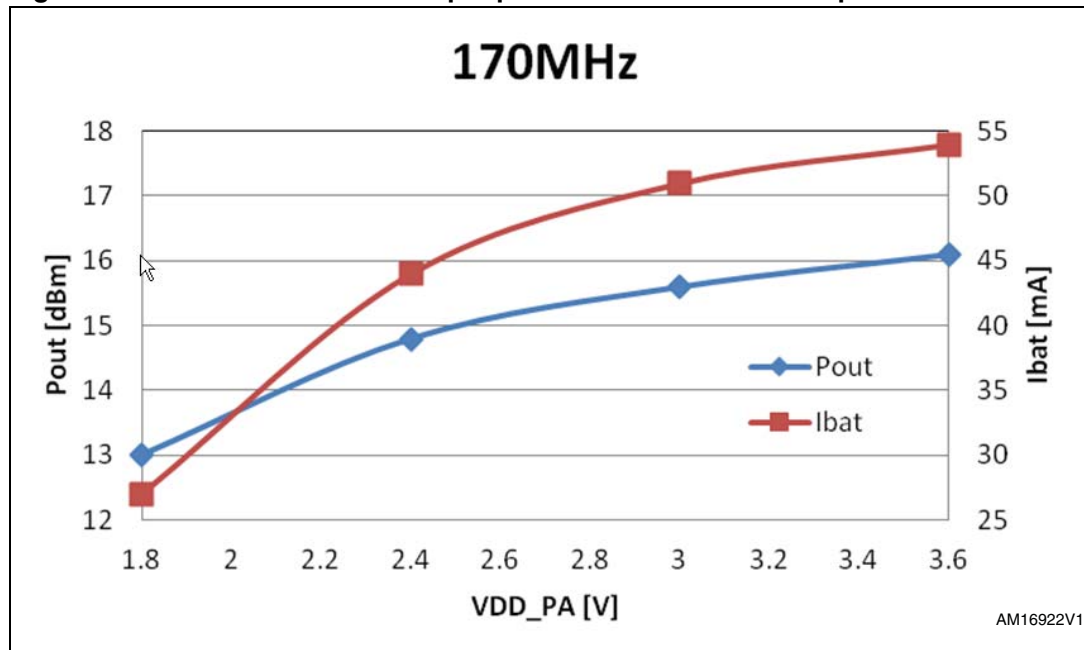
The SPIRIT1 has been configured to emit the maximum value of output power, setting the PA_LEVEL word of the SPIRIT1 PA_POWER registers with PA_LEVEL=1.

2.1 170 MHz band

Table 1. 170 MHz maximum output power and current consumption

Voltage supply V_{BAT}	Maximum output power (measured at connector)	Current consumption (TX mode)
3.6 V	+16.1 dBm	54 mA
3.0 V	+15.6 dBm	51 mA
2.4 V	+14.8 dBm	44 mA
1.8 V	+13.0 dBm	27 mA

Figure 3. 170 MHz maximum output power and current consumption chart

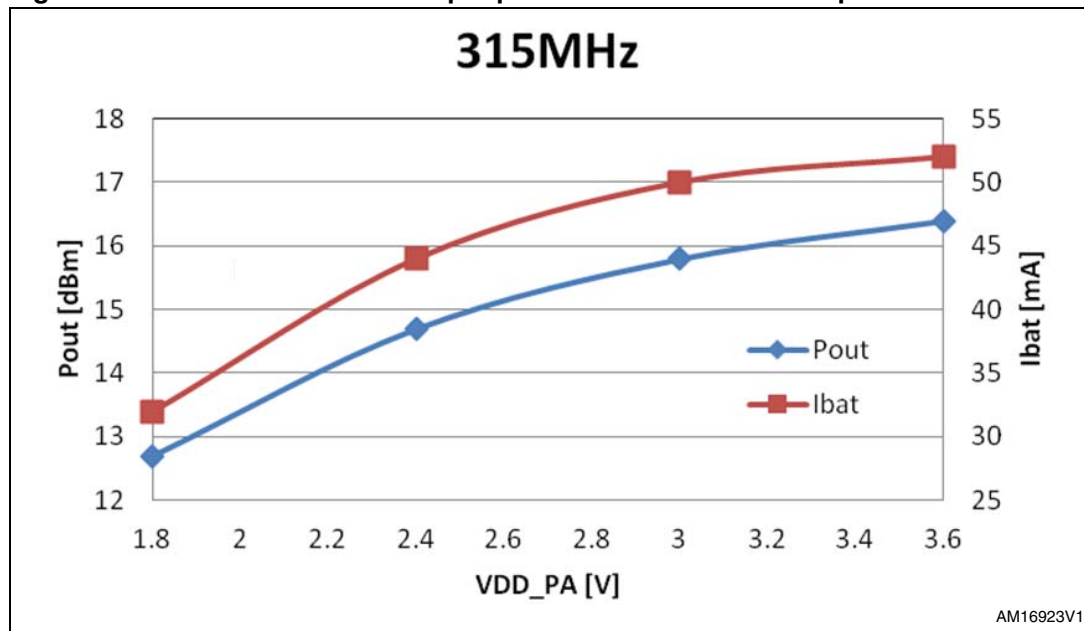


2.2 315 MHz band

Table 2. 315 MHz maximum output power and current consumption

Voltage supply V_{BAT}	Maximum output power (measured at connector)	Current consumption (TX mode)
3.6 V	+16.4 dBm	52 mA
3.0 V	+15.8 dBm	50 mA
2.4 V	+14.7 dBm	44 mA
1.8 V	+12.7 dBm	32 mA

Figure 4. 315 MHz maximum output power and current consumption chart

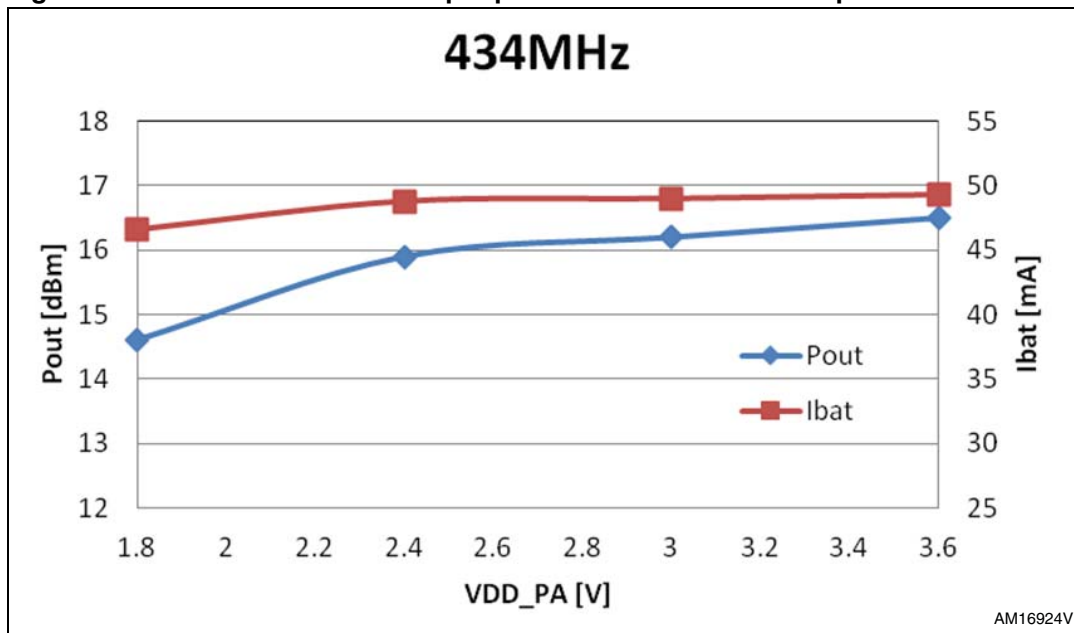


2.3 434 MHz band

Table 3. 434 MHz maximum output power and current consumption

Voltage supply V_{BAT}	Maximum output power (measured at connector)	Current consumption (TX mode)
3.6 V	+16.5 dBm	49.3 mA
3.0 V	+16.2 dBm	49 mA
2.4 V	+15.9 dBm	48.8 mA
1.8 V	+14.6 dBm	46.6 mA

Figure 5. 434 MHz maximum output power and current consumption chart

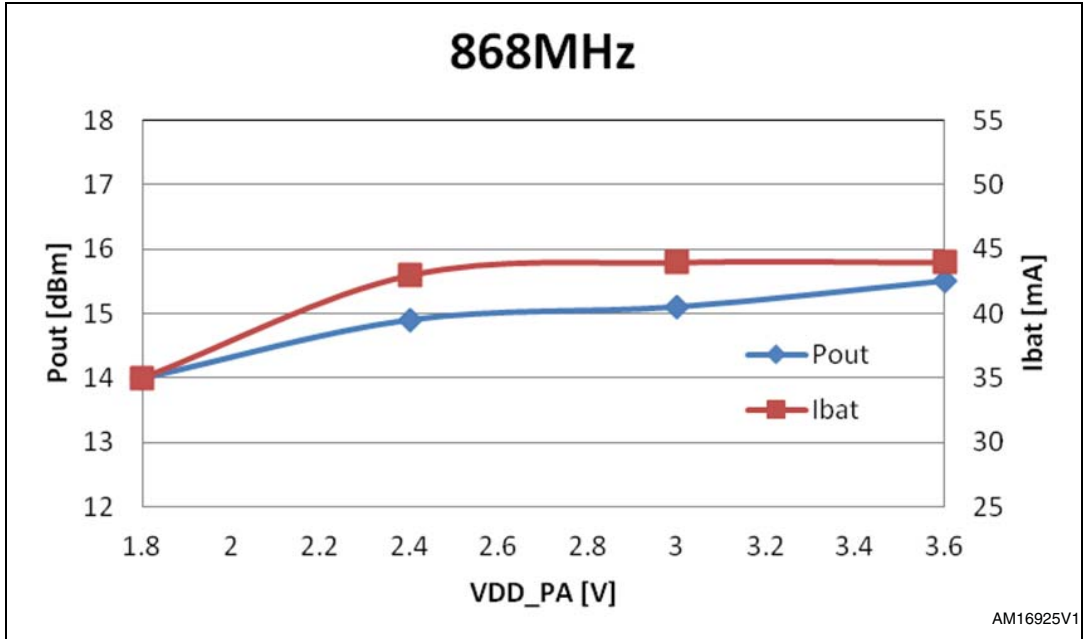


2.4 868 MHz band

Table 4. 868 MHz maximum output power and current consumption

Voltage supply V _{BAT}	Maximum output power (measured at connector)	Current consumption (TX mode)
3.6 V	+15.5 dBm	44 mA
3.0 V	+15.1 dBm	44 mA
2.4 V	+14.9 dBm	43 mA
1.8 V	+14.0 dBm	35 mA

Figure 6. 868 MHz maximum output power and current consumption chart

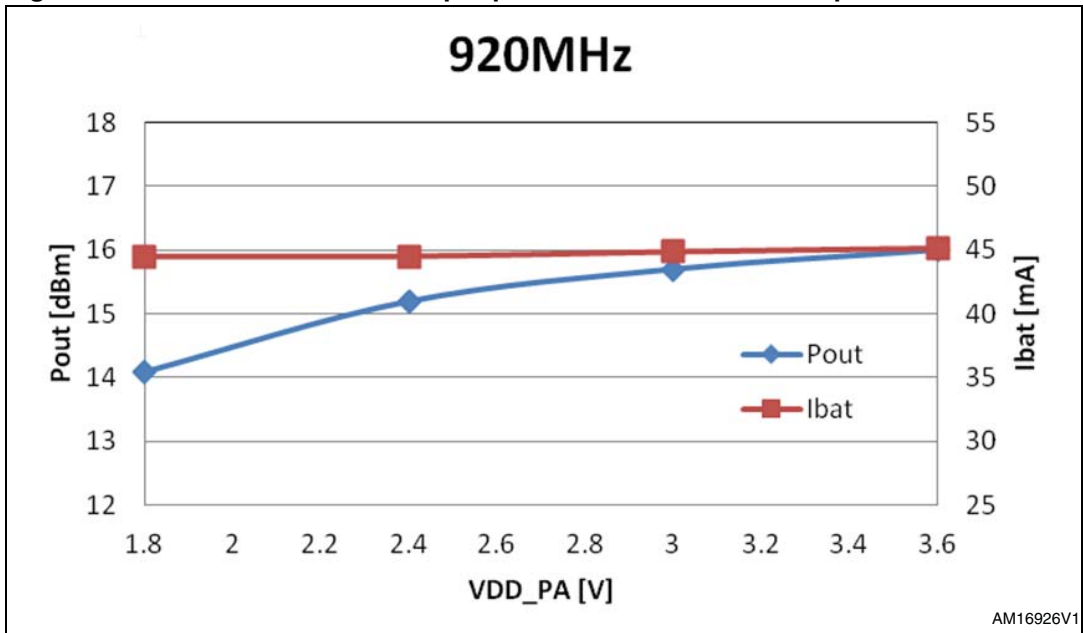


2.5 920 MHz band

Table 5. 920 MHz maximum output power and current consumption

Voltage supply V_{BAT}	Maximum output power (measured at connector)	Current consumption (TX mode)
3.6 V	+16 dBm	45.2 mA
3.0 V	+15.7 dBm	44.9 mA
2.4 V	+15.2 dBm	44.5 mA
1.8 V	+14.1 dBm	44.5 mA

Figure 7. 920 MHz maximum output power and current consumption chart



3 Reference

[1] STMicroelectronics SPIRIT1 datasheet.

4 Revision history

Table 6. Document revision history

Date	Revision	Changes
22-Nov-2012	1	Initial release.

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