

FRAUNHOFER INSTITUTE FOR INTEGRATED CIRCUITS IIS

RFicient[®]

ULTRA-LOW POWER WAKE-UP RECEIVER

APPLICATION NOTE AP004

WakeUp Dune3 RF-Board 868 MHz Band SAW, SMA

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WakeUp Dune3 RF-Board 868 MHz Band SAW, SMA

1. Introduction

This document is an application note for the Dune 3 WakeUp receiver. Its purpose is to give recommendations and an example for PCB level integration of the receiver IC. The PCB layout, the specified components and their respective values are to serve as a recommendation for customer-specific implementations. In order to achieve the performance specified in the data sheet, it is advisable to follow these recommendations when implementing the board layout. For operation with tri-band use cases in 433, 868 and 2400 MHz ISM bands, refer to the dedicated application note AP0003

2. RF-board structure

RFicient® WakeUp Dune3 RF-Board shown in Figure 1. It is a PCB equipped with RFicient® WakeUp Dune3 receiver IC. On the right side of the RF-Board is an SMA connector for 868 MHz band. This can be equipped with an antenna. In order to suppress the minor RF interferences the RF-Board is equipped with a narrowband SAW Filter Epcos B3574. SAW Filter center frequency is typical 868.3 MHz such as 4.2 dB insertion loss.

The outputs OUT1 and OUT2 are led out as measuring points on the top of the RF-Board. On the back of the RF-Board are two Samtec connection plugs for the mainboard and the block capacitors of the chip's power supply. Please refer to the data sheet or the getting started guide (AP002) for configuration of the receiver IC, in order to select the desired frequency band settings.

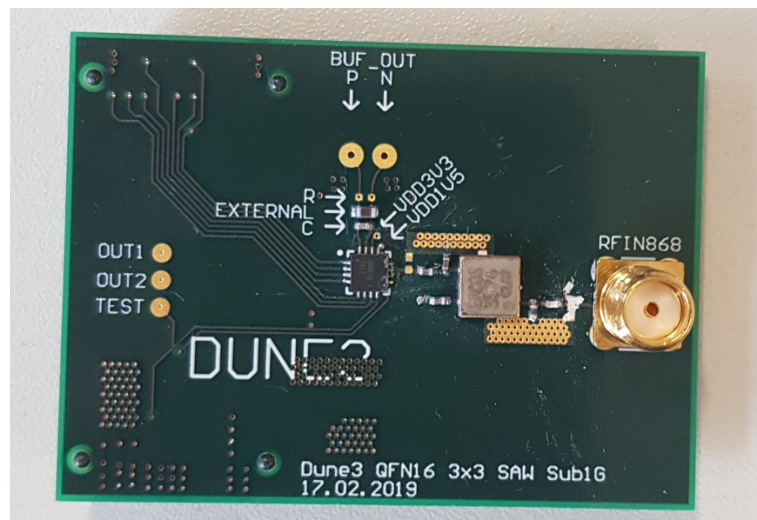


Figure 1: RF-Board Dune3 868 MHz SAW

3. RF matching network

To achieve the typical sensitivity specified in the datasheet it is necessary to adhere to the specifications of the RF matching network. RF-Board schematic shown in Figure 2. Recommended values and types of passive components are shown in Table 1.

A critical point in design and dimensioning of the RF matching network is the length of the transmission line between IC and LSERL inductor. Table 1 recommendations refer to a length of appr. 2.4 mm (pad edge to pad edge). Impedance of transmission lines on the PCB is 50 Ohm.

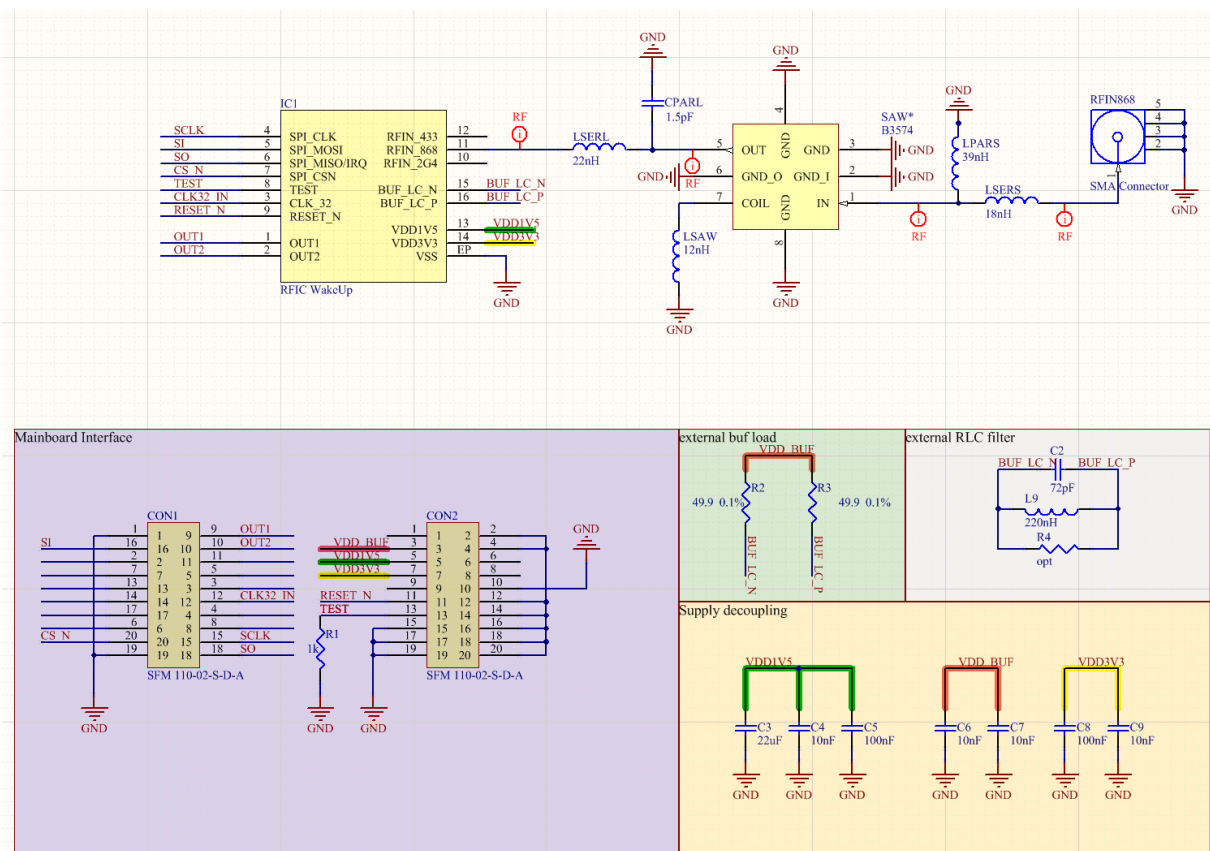


Figure 2: Figure 1: RF-Board Dune3 868 MHz SAW Schematic

Identifier	Value	Type
LSERL	22 nH	Coilcraft, 0402CS-22NXGLU
CPARL	1.5 pF	Multicomp, MCHH15N1R5B500CT
LSAW	12 nH	Coilcraft, 0402CS-12NXGLU
LPARS	39 nH	Coilcraft, 0402CS-39NXGLU
LSERS	18 nH	Coilcraft, 0402CS-18NXGLU

Table 1: passives recommendations

4. PCB

Matching network on PCB-Layout shown in Figure 2.

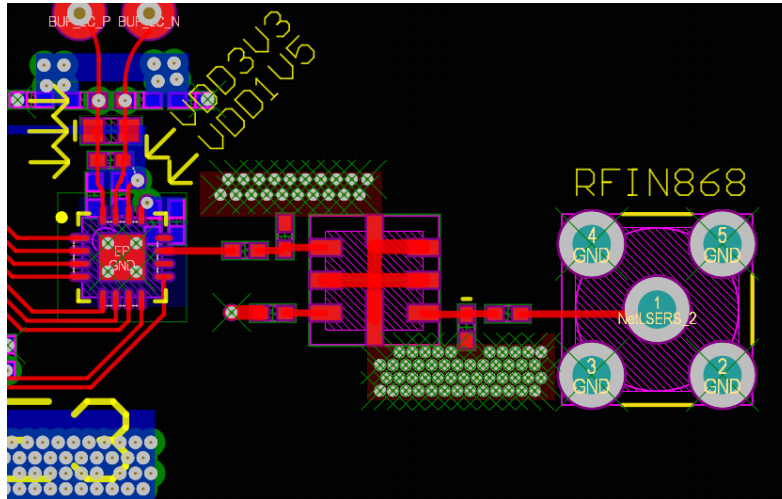


Figure 3: RF-Board Dune3 868 MHz SAW Matching Network PCB

5. Start with the Dune3 RF-Board 868 MHz Band SAW

Plug the RF-Board onto the mainboard. In order for the mainboard to recognize the RF-Board, make sure that the mainboard is flashed with the Dune3 firmware. Successful detection of the RF-Board is indicated by turning on the mainboard power banks 1 and 2 LEDs (VDDBankLED1/2). If the power banks are on, the RF-Board is ready for use. The control is done with the WakeUpEvalSuite. The LEDs A and B on the mainboard are connected to the RF-Board outputs: LED_A(OUT1), LED_B(OUT2). These indicate with flashing green light the states of the two pins.

Table 2 shows the pin mapping of the RF-Board to the motherboard.

Header Connector Mainboard	RF Board-Pin	WakeUp pin	RF Board-Connector
IO15	16	SPI_MOSI	CON1
IO17	20	SPI_CSN	CON1
IO4	9	OUT1	CON1
IO13	10	OUT2	CON1
IO20	12	CLK_32	CON1
IO7	15	SPI_CLK	CON1
IO16	18	SPI_MISO	CON1
IO18	11	RESET_N	CON2
IO19	13	TEST	CON2
VDD1	7	VDD3V3	CON2
VDD2	5	VDD1V5	CON2

Table 2: RF Board I/O Mainboard Mapping