nRF24L01 Software Driver for C51 Microcontrollers

nRF24L01 is a single chip RF-transceiver intended for applications in the 2.4 GHz ISM to 2.5 GHz band.

AT89C5131A is a high-performance Flash version of the 80C51 single-chip 8-bit micro controllers with full speed USB functions.

This application note describes the nRF24L01 software driver running on AT89C5131A micrcontroller.

References

AT89C5131A data sheet (available on www.atmel.com)

nRF24L01 data sheet (available on www.nordicsemi.no)

Acronyms

USB:
Universal Serial Bus

ISM:
Industrial, Scientific and Medical (radio spectrum)

Software Driver for C51 Microcontrollers

Application Note

7651A–USB–05/06

Software Driver Overview

The nRF24L01/AT89C5131A driver is composed of 3 parts:

1/ **nRF24L01 driver:**

This part contains the functions to init the nRF24L01 in transmission mode or reception mode. This part contains also the interrupt function.

The list of files is:

- nRF24L01_lib.c
- nRF24L01_lib.h

2/ **Nordic driver:**

This part contains files from Nordic evaluation kit (source code available on www.nordicsemi.no).

The list of files is:

- Protocol_API.c
- Protocol_API.h
- nRF_API.c
- nRF_API.h

3/ **Low level driver:**

This part contains files with low level functions to control AT89C5131A IOs and SPI commands. The low level driver calls SPI functions from a C51 library.

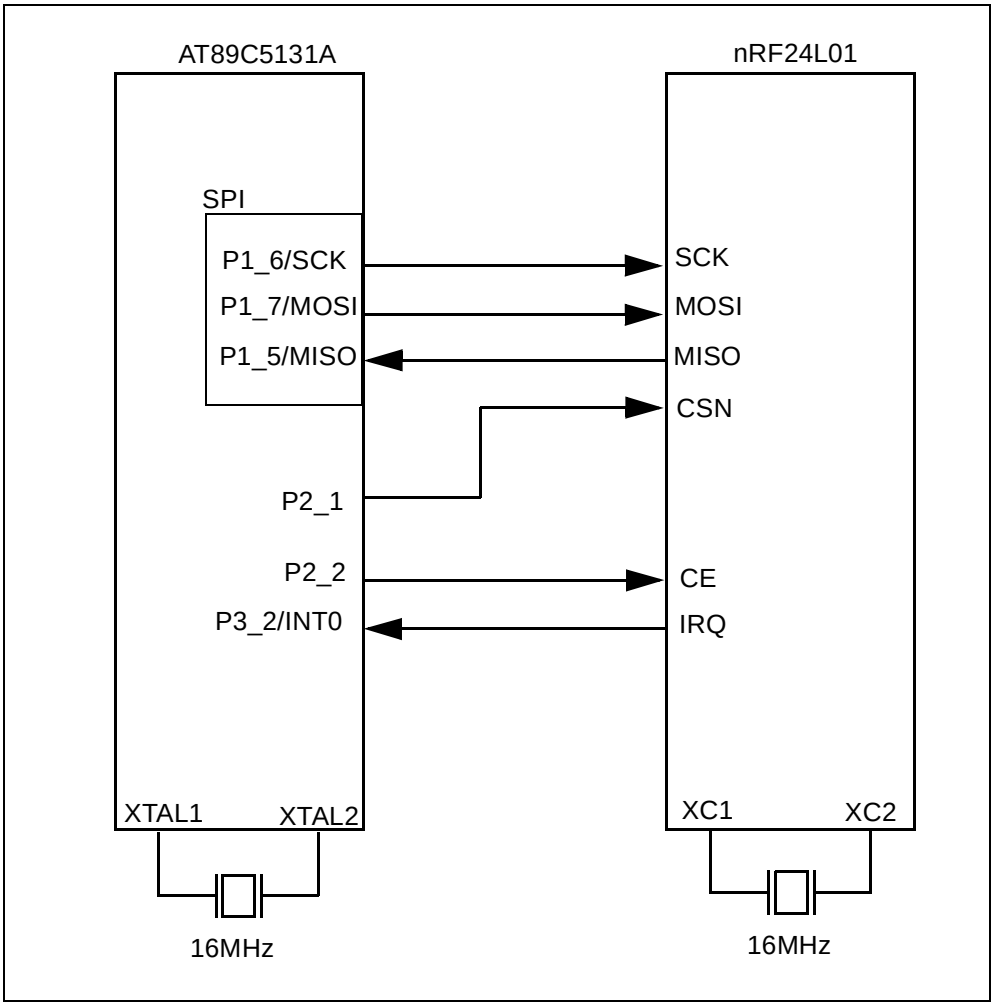
The list of files is:

- LL_API_C51.c
- LL_API_C51.h

Hardware Description

This driver is based on the hardware configuration described in Fig 1.

Figure 1. AT89C5131A and nRF24L01



Note: Both ICs can share the same crystal if they are placed on the same PCB.

The nRF24L01 signals are separated in two parts:

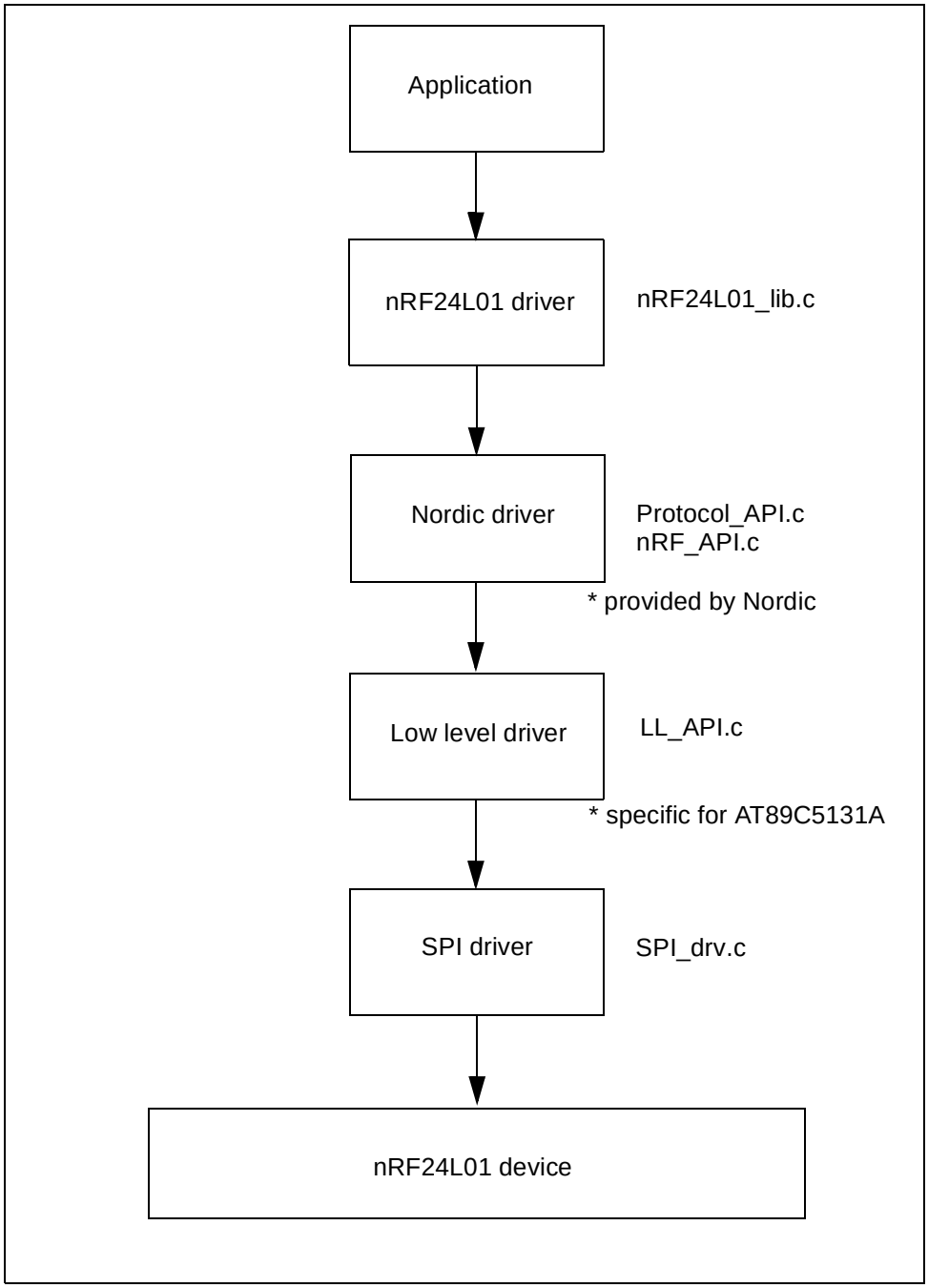
- **SPI:** the read/write operations on nRF24L01 registers come from the AT89C5131A hardware SPI bus (ENABLE, CLOCK, DATA).
- **IO lines:** the control of CE and CSN signals is done by 2 IO lines. The IRQ signal from nRF24L01 is connected to the external interrupt input (INT0) of the AT89C5131A.

nRF24L01 Software Driver Description

A list of functions (based on SPI commands) is proposed to:

- send the configuration to nRF24L01
- send/receive data on RF part of nRF24L01.

Figure 2. Software Architecture



Application layer

The application calls “open”, “putc” and “getc” functions.

Table 1. Application functions

Application function	Description
open()	Init device
putc()	Send a data byte on RF part
getc()	Receive a data byte on RF part

nRF24L01 driver

The nRF24L01 driver contains functions to send/receive data via RF. The nRF24L01 driver calls Nordic functions from Protocol_API and nRF_API files.

Table 2. Application functions

Application function	nRF24L01 function	Description
open()	nRF24L01_init()	UART init and nRF24L01 init
putc()	nRF24L01_send_byte()	Send a data byte on RF part
getc()	nRF24L01_receive_byte()	Receive a data byte on RF part

Low Level layer

The nRF24L01 driver manages the configuration of nRF24L01 by using the hardware SPI bus of AT89C5131A.

Table 3. nRF24L01 low level functions

Function name	Parameters	Description
SPI_Init	SPI Mode (hardware)	Init C5131 hardware SPI
C5131_enable_it		Enable C5131 IT on INT0 pin
nRF24L01_reset		Reset/Unreset nRF24L01
nRF24L01_tx_config		Configure nRF24L01 in Tx mode
nRF24L01_rx_config		Configure nRF24L01 in Rx mode
SPI_HW	Data to send	Send a byte via RF
CSN_Pin	State (0 or 1)	Control of CSN pin of nRF24L01
CE_Pin	state (O or 1)	Control of CE pin of nRF24L01

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