n-Blocks

n-PRO-30

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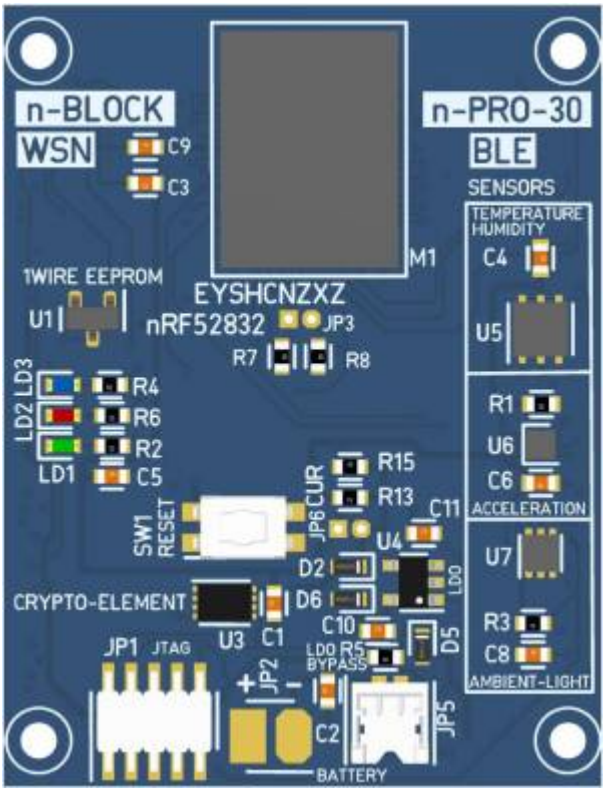
n-PRO-30

n-PRO-30 is an mbed-enabled Bluetooth Low Energy development board from the n-Blocks family, in the standard n-Blocks pro form factor.



n-PRO-30

n-PRO-30

License	GPL 2.0
Status	Tested-Blink
Buy at:	
Categories	
Hardware repo	Bitbucket
Firmware repo	

Overview

n-PRO-30 is a simple Bluetooth Low Energy board based on Nordic nRF58232. It consists of temperature/humidity sensor, acceleration sensor and ambient light sensor which can be used to collect data and transmit it over bluetooth. The board supports the standard Nordic Software Development Tool-chain using Keil, IAR and GCC. It also supports ARM mbed tool-chain for rapid prototyping and development using mbed's IDE and tool-chain with an extensive range of open-source software libraries.

MCU Features

- 2.4 GHz transceiver
  - -96 dBm sensitivity in Bluetooth® Low Energy mode
  - Supported data rates: 1 Mbps, 2 Mbps Bluetooth Low Energy mode
  - -20 to +4 dBm TX power, configurable in 4 dB steps
  - On-chip balun (single-ended RF)
  - 5.3 mA peak current in TX (0 dBm)
  - 5.4 mA peak current in RX
  - RSSI (1 dB resolution)
- ARM® Cortex®-M4 32-bit processor with FPU, 64 MHz
  - 215 EEMBC CoreMark score running from flash memory
  - 58 µA/MHz running from flash memory
  - 51.6 µA/MHz running from RAM
- Flexible power management
  - 1.7 V–3.6 V supply voltage range
  - Fully automatic LDO and DC/DC regulator system
  - Fast wake-up using 64 MHz internal oscillator
  - 0.3 µA at 3 V in System OFF mode
  - 0.7 µA at 3 V in System OFF mode with full 64 kB RAM retention
  - 1.9 µA at 3 V in System ON mode, no RAM retention, wake on RTC
- Memory
  - 512 kB flash/64 kB RAM
  - 256 kB flash/32 kB RAM

- Nordic SoftDevice ready
- Support for concurrent multi-protocol
- Type 2 near field communication (NFC-A) tag with wakeup-on-field and touch-to-pair capabilities
- 12-bit, 200 ksps ADC - 8 configurable channels with programmable gain
- 64 level comparator
- 15 level low power comparator with wakeup from System OFF mode
- Temperature sensor
- 32 general purpose I/O pins
- 3x 4-channel pulse width modulator (PWM) unit with EasyDMA
- Digital microphone interface (PDM)
- 5x 32-bit timer with counter mode
- Up to 3x SPI master/slave with EasyDMA
- Up to 2x I2C compatible 2-wire master/slave
- I2S with EasyDMA
- UART (CTS/RTS) with EasyDMA
- Programmable peripheral interconnect (PPI)
- Quadrature decoder (QDEC)
- AES HW encryption with EasyDMA
- Autonomous peripheral operation without CPU intervention using PPI and EasyDMA

- 3x real-time counter (RTC)
- Single crystal operation

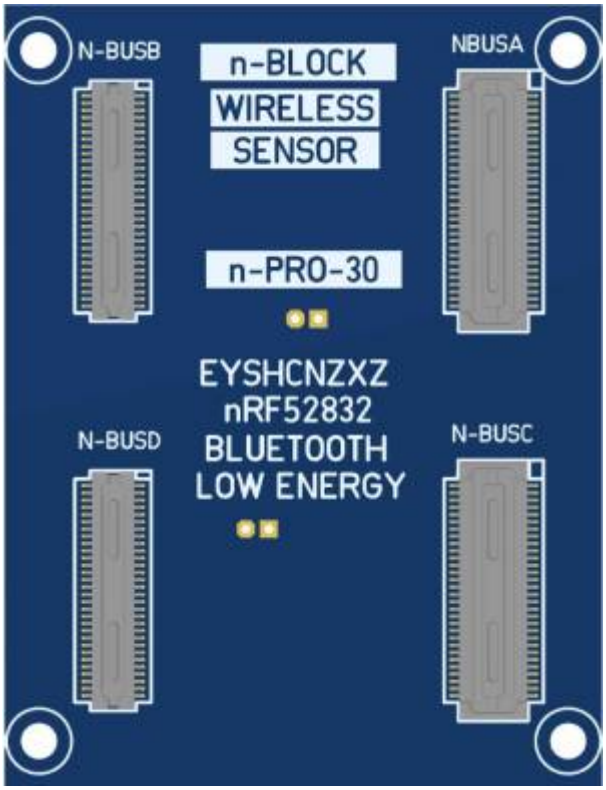
n-PRO-30 Features

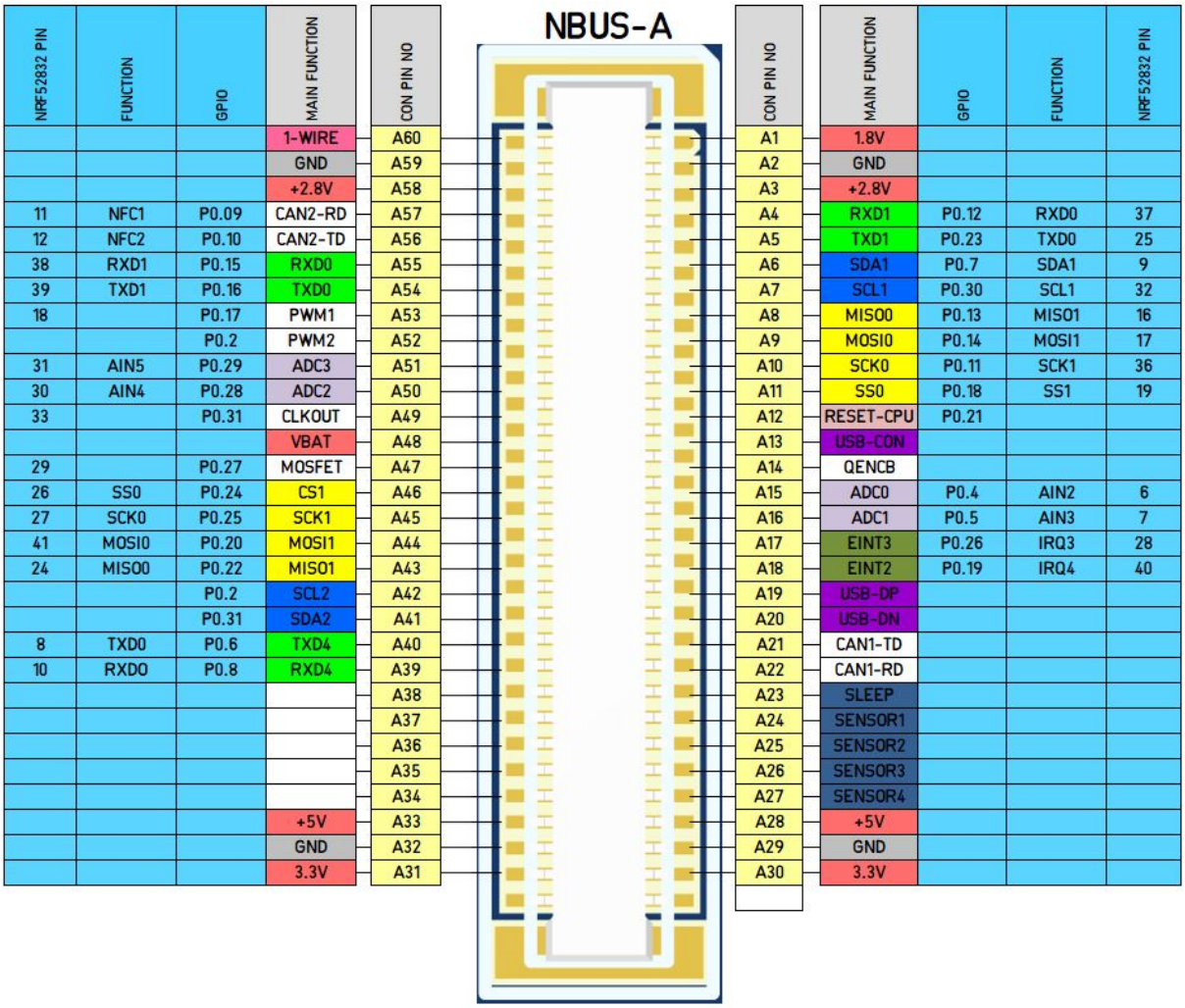
- Tayio module integrates nRF52832 and antenna
- Simple and Low Power
- Additional “industry standard” RF module socket
- Miniature Li-Ion battery connector (optional)

- mbed compatibility supports BLE and easy development (use Nordic nRF52-DK platform)
- nRF5 SDK for Mesh
- IoT SDK for applications using IPv6 over Bluetooth low energy

Board Pinout

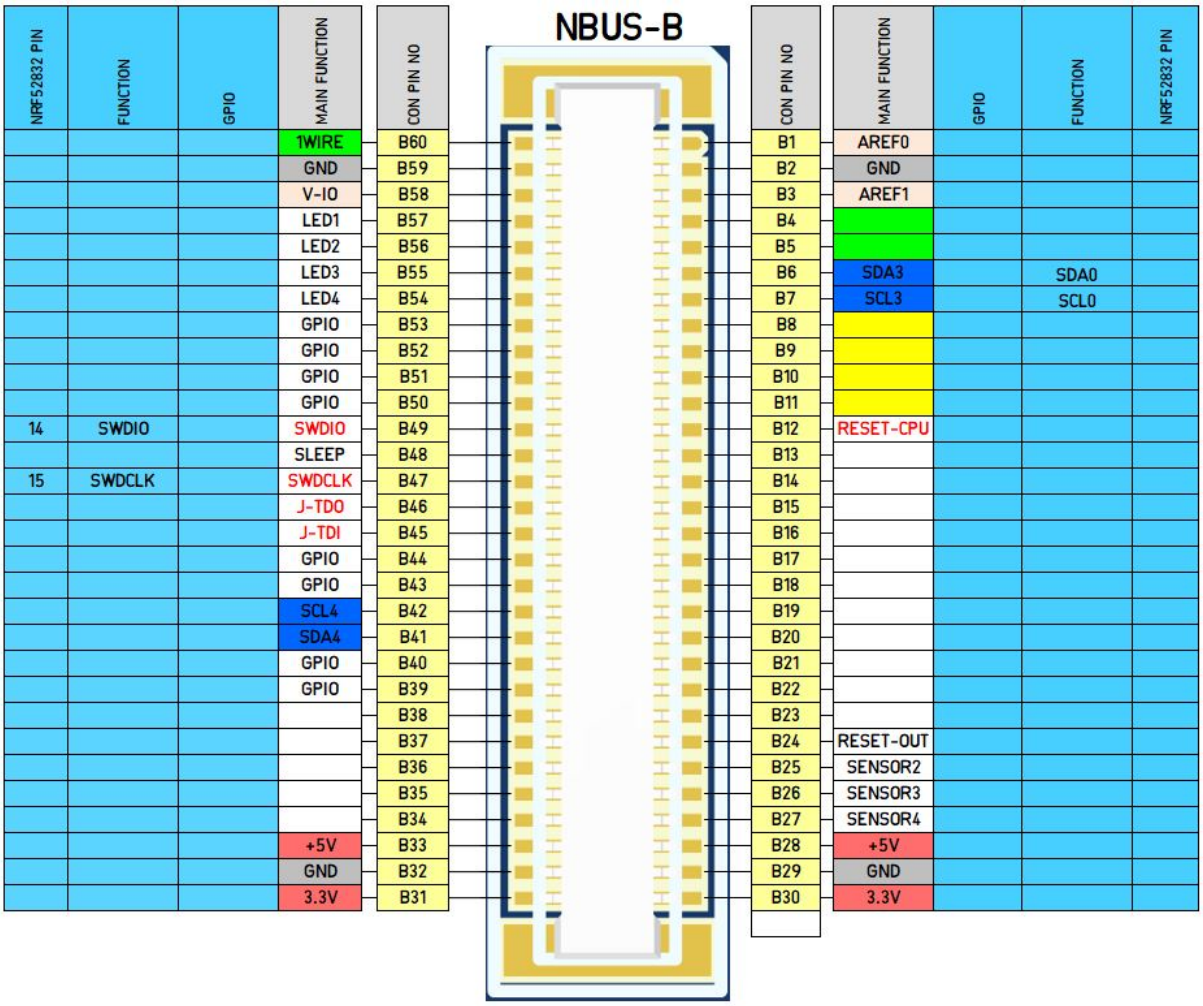
n-PRO-30 is a **HOST** board with four Hirose DF30-series 60-pin low profile connectors at bottom side, following the n-Blocks PRO form factor.

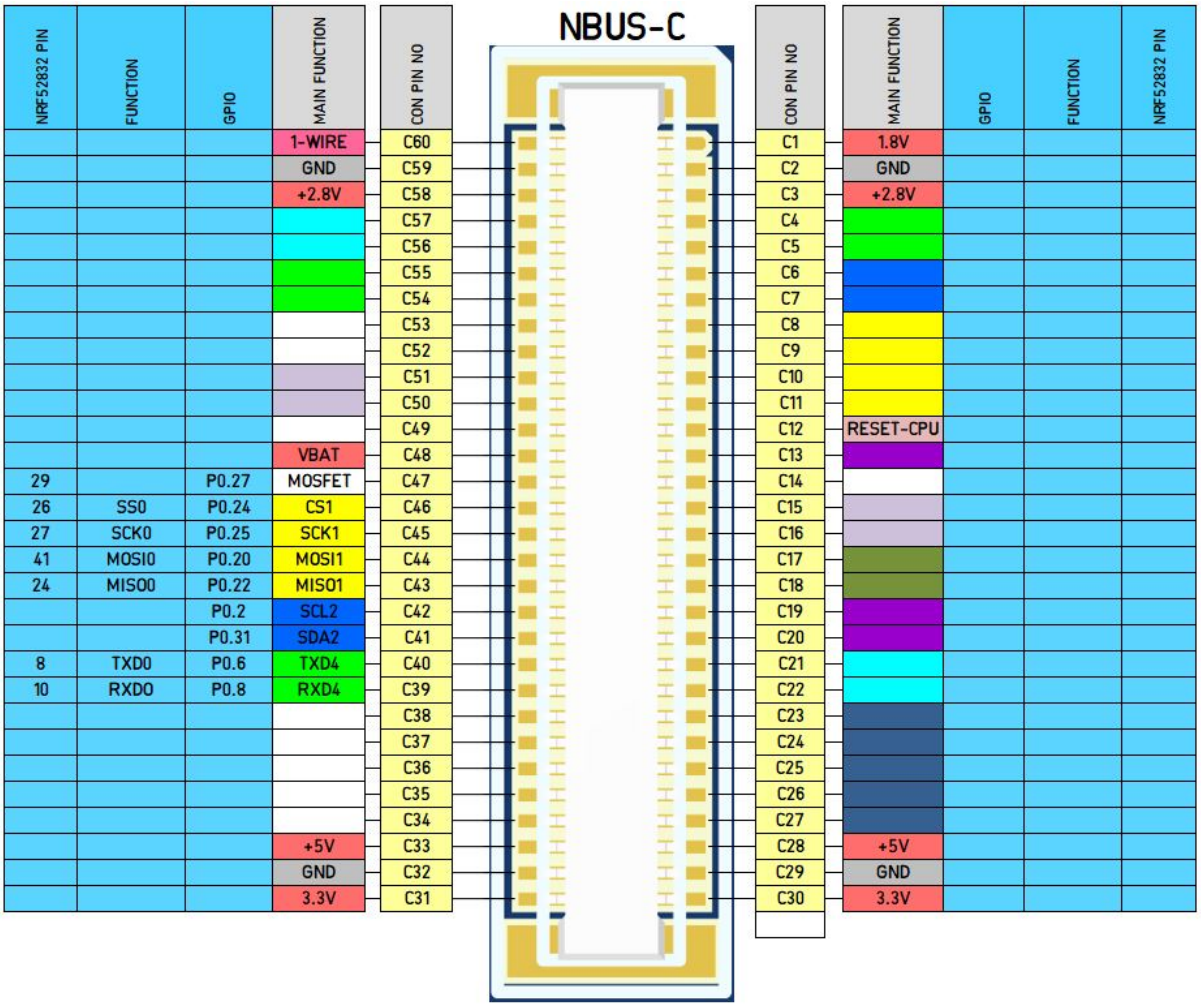

N-BUSB
n-BLOCK
WIRELESS
SENSOR
NBUSA
n-PRO-30
EYSHCNZXZ
nRF52832
BLUETOOTH
LOW ENERGY
N-BUSD
N-BUSC



NRF52832 PIN	FUNCTION	GPIO	MAIN FUNCTION	CON PIN NO
			1-WIRE	A60
			GND	A59
			+2.8V	A58
11	NFC1	P0.09	CAN2-RD	A57
12	NFC2	P0.10	CAN2-TD	A56
38	RXD1	P0.15	RXD0	A55
39	TXD1	P0.16	TXD0	A54
18		P0.17	PWM1	A53
		P0.2	PWM2	A52
31	AIN5	P0.29	ADC3	A51
30	AIN4	P0.28	ADC2	A50
33		P0.31	CLKOUT	A49
			VBAT	A48
29		P0.27	MOSFET	A47
26	SS0	P0.24	CS1	A46
27	SCK0	P0.25	SCK1	A45
41	MOSI0	P0.20	MOSI1	A44
24	MISO0	P0.22	MISO1	A43
		P0.2	SCL2	A42
		P0.31	SDA2	A41
8	TXD0	P0.6	TXD4	A40
10	RXD0	P0.8	RXD4	A39
				A38
				A37
				A36
				A35
				A34
			+5V	A33
			GND	A32
			3.3V	A31

CON PIN NO	MAIN FUNCTION	GPIO	FUNCTION	NRF52832 PIN
A1	1.8V			
A2	GND			
A3	+2.8V			
A4	RXD1	P0.12	RXD0	37
A5	TXD1	P0.23	TXD0	25
A6	SDA1	P0.7	SDA1	9
A7	SCL1	P0.30	SCL1	32
A8	MISO0	P0.13	MISO1	16
A9	MOSI0	P0.14	MOSI1	17
A10	SCK0	P0.11	SCK1	36
A11	SS0	P0.18	SS1	19
A12	RESET-CPU	P0.21		
A13	USB-CON			
A14	QENCB			
A15	ADC0	P0.4	AIN2	6
A16	ADC1	P0.5	AIN3	7
A17	EINT3	P0.26	IRQ3	28
A18	EINT2	P0.19	IRQ4	40
A19	USB-DP			
A20	USB-DN			
A21	CAN1-TD			
A22	CAN1-RD			
A23	SLEEP			
A24	SENSOR1			
A25	SENSOR2			
A26	SENSOR3			
A27	SENSOR4			
A28	+5V			
A29	GND			
A30	3.3V			


NBUS-B
NRF52832 PIN
FUNCTION
GPIO
MAIN FUNCTION
CON PIN NO
1WIRE B60
GND B59
V-IO B58
LED1 B57
LED2 B56
LED3 B55
LED4 B54
GPIO B53
GPIO B52
GPIO B51
GPIO B50
14 SWDIO SWDIO B49
SLEEP B48
15 SWDCLK SWDCLK B47
J-TDO B46
J-TDI B45
GPIO B44
GPIO B43
SCL4 B42
SDA4 B41
GPIO B40
GPIO B39
B38
B37
B36
B35
B34
+5V B33
GND B32
3.3V B31
B1 AREF0
B2 GND
B3 AREF1
B4
B5
B6 SDA3 SDA0
B7 SCL3 SCL0
B8
B9
B10
B11
B12 RESET-CPU
B13
B14
B15
B16
B17
B18
B19
B20
B21
B22
B23
B24 RESET-OUT
B25 SENSOR2
B26 SENSOR3
B27 SENSOR4
B28 +5V
B29 GND
B30 3.3V


NBUS-C
NRF52832 PIN
FUNCTION
GPIO
MAIN FUNCTION
CON PIN NO
1-WIRE
GND
+2.8V
VBAT
29
P0.27
MOSFET
26
SS0
P0.24
CS1
27
SCK0
P0.25
SCK1
41
MOSI0
P0.20
MOSI1
24
MISO0
P0.22
MISO1
P0.2
SCL2
P0.31
SDA2
8
TXD0
P0.6
TXD4
10
RXD0
P0.8
RXD4
+5V
GND
3.3V
C60
C59
C58
C57
C56
C55
C54
C53
C52
C51
C50
C49
C48
C47
C46
C45
C44
C43
C42
C41
C40
C39
C38
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C35
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C33
C32
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C1
C2
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C11
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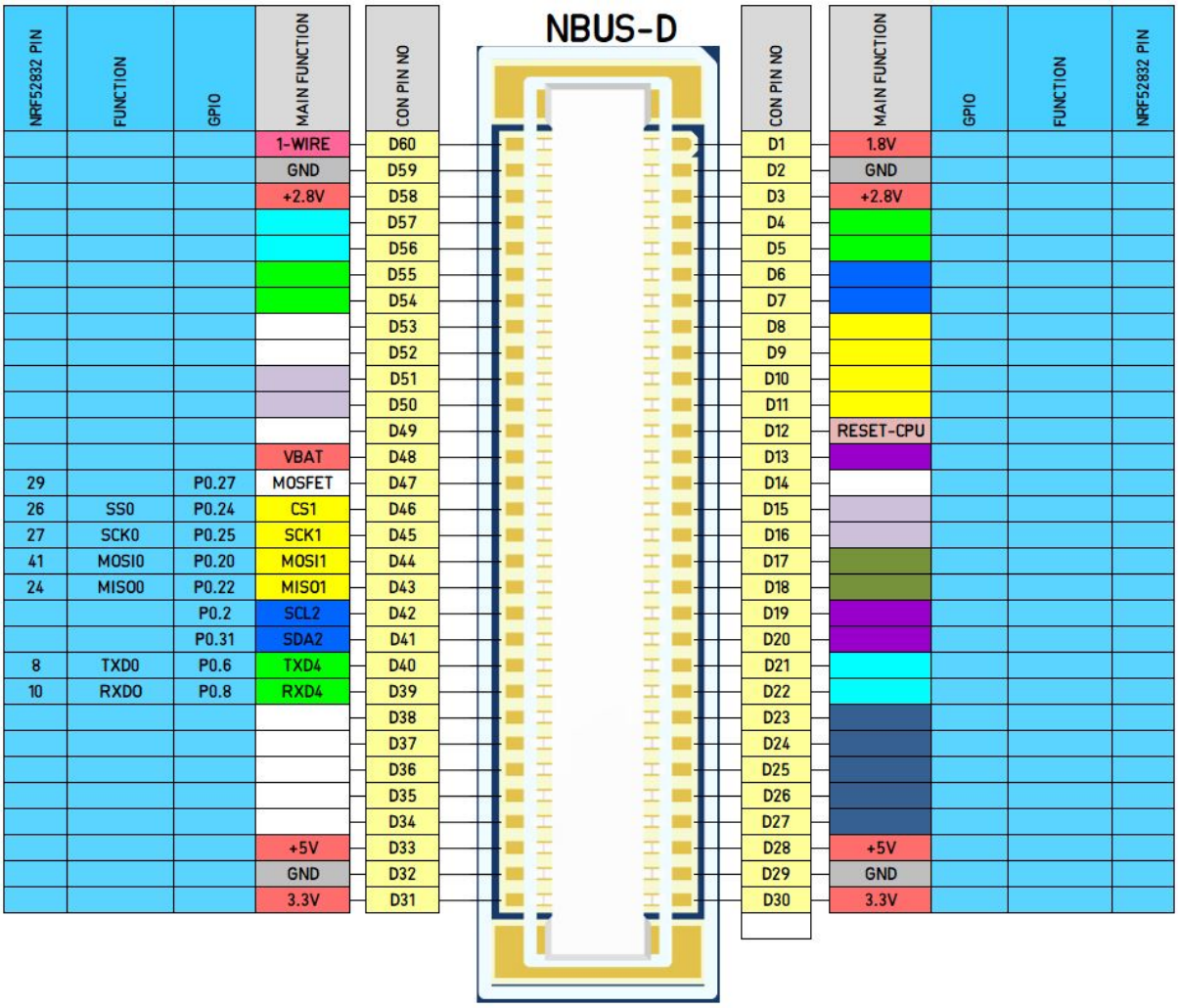
C15
C16
C17
C18
C19
C20
C21
C22
C23
C24
C25
C26
C27
C28
C29
C30
1.8V
GND
+2.8V
RESET-CPU
+5V
GND
3.3V



Getting started

Blinky using Nordic SDK

- Follow the first part of this tutorial
- Download and install GNU Arm Embedded Toolchain
- Update the PATH variable(s) to include the GNU tools, something like:

```
C:\Program Files (x86)\GNU Tools ARM Embedded\7 2017-q4-major\bin
```

- Test the path by typing

```
arm-none-eabi-gcc --version
```

- Download and UNZIP in a convenient directory nRF5 SDK Software Development Kit for the nRF51 Series and nRF52
- Download and UNZIP in a convenient directory the build tools from here
- Update the PATH to include Build Tools directory, or copy the .exe files from .bin directory to blinky project directory
- Set the toolchain path in **makefile.windows**, located in

```
<SDK>/components/toolchain/gcc
```

- It should be something like:

```
GNU_INSTALL_ROOT := $(PROGFILES)/GNU Tools ARM Embedded/4.9 2015q3
// Toolchain path
GNU_VERSION := 4.9.3
GNU_PREFIX := arm-none-eabi
```

- Copy the .exe files from .bin directory to blinky project directory
- Edit main.c, changing the GPIO line that is connected to the LED:

```
#include <stdbool.h>
#include <stdint.h>
#include "nrf_delay.h"
#include "boards.h"

int main(void)
{
    NRF_GPIO->DIRSET = (1 << 17);   // GPIO17 output,n-DAP LED

    /* Toggle LED */
    while (true)
    {
            NRF_GPIO->OUTSET = (1 << 17); // GPIO17 HIGH
            nrf_delay_ms(100);
            NRF_GPIO->OUTCLR = (1 << 17); // GPIO17 LOW
            nrf_delay_ms(100);
    }
}
```

- Open command-line and change directory to

```
<SDK>\examples\peripheral\blinky\pca10040\blank\armgcc
```

- Run

```
make
```

- Program the Flash Memory n-BLE with the created `.bin` file:

```
F:\prj_soft\nRF5_SDK_12.3.0_d7731ad\examples\peripheral\blinky\pca1
0040\blank\armgcc\_build\nrf52832_xxaa.bin
```

Blinky with mbed online compiler

- Select target `Nordic nRF52-DK`
- Create a blinky program like below

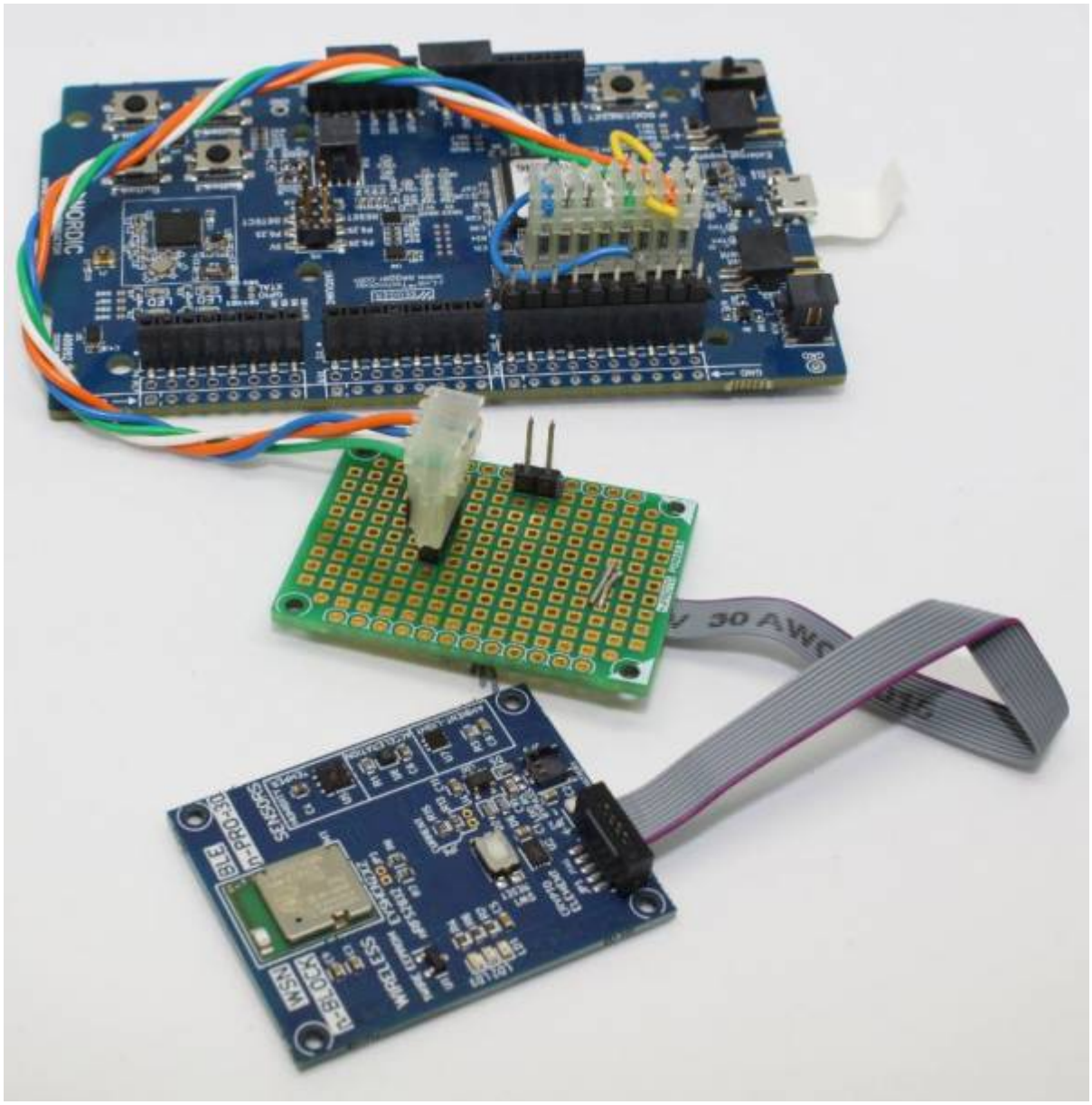
```
#include "mbed.h"

DigitalOut led1(P0_17);

// main() runs in its own thread in the OS
int main() {
    while (true) {
        led1 = !led1;
        wait(0.05);
    }
}
```

- Program the Flash memory with the created `.hex` file

Flash Memory Programming

Programming with Nordic nRF52-DK board

- nRF52-DK can be used as SWD programmer.
- A DIY adaptation cable is needed.



- nRF52-DK appears as a USB DISK. Just drag and drop the file created from compiler to the disk.
- nRF52-DK can use both `.hex` and `.bin` files.
- mbed on-line compiler produces `.hex`, while GCC produces `.bin` and `.hex`

USE-CASE examples

- BLE Beacon Humidity & Temperature Sensor
- BLE Beacon Environmental Sensor
- LoRa Sensor with BLE Commisioning
- BLE simple Beacon for Localisation

Related articles in this Wiki

- n-pro-30

RF, CPU, nblock, BLE, nsensorRF

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