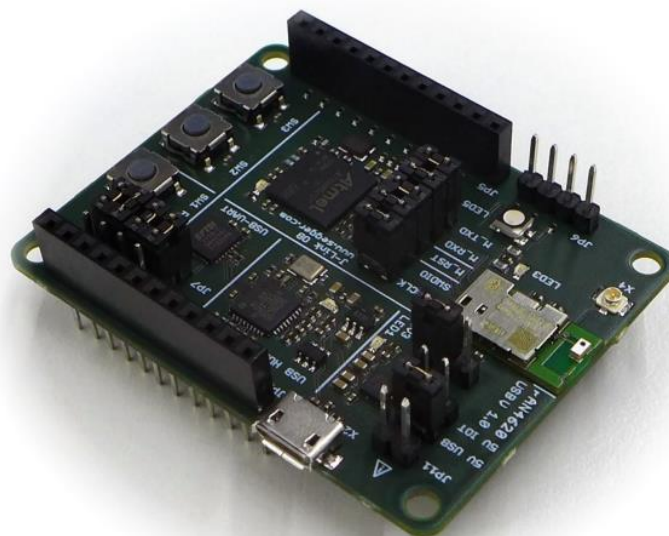


PAN4620

IEEE[®] 802.15.4 and Bluetooth[®] Low Energy Module

Quick Start Guide

Rev. 0.1



Overview

The PAN4620 is Panasonic's Internet of Things dual mode module comprising NXP's Kinetis® MKW41Z512CAT4 SoC – a 2.4 GHz 802.15.4 and Bluetooth Low Energy (LE) wireless radio microcontroller based on an ARM® Cortex®-M0+ core.

Features

- UART, SPI, I²C, TSI, ADC, and DAC
- Same form factor and compatible pinout for VCC, GND, Reset, UART, I²C, and SWD as PAN1026, PAN1760, PAN1760A, and PAN1761
- Single and concurrent operation of IEEE 802.15.4 and Bluetooth LE
- Open to various known application layers or proprietary solutions
- Surface Mount Type dimensions: 15.6 mm x 8.7 mm x 1.9 mm
- On module 32 MHz and 32 kHz crystal
- SoC: NXP Kinetis KW41Z – 2.4 GHz 802.15.4 and Bluetooth LE 4.2 Wireless Radio Microcontroller
- Core: Up to 48 MHz 32 bit ARM Cortex-M0+
- Memory: 512 kB of flash and 128 kB of SRAM
- Voltage range: 1.8 V to 4.2 V
- Temperature range: -40 °C to 85 °C

Characteristics

- Transceiver frequency range 2 360 MHz to 2 483.5 MHz
- Programmable transmitter output power: -30 dBm to 3 dBm
- Receiver sensitivity (Bluetooth LE): -93 dBm
- Receiver sensitivity typical for IEEE Standard 802.15.4: -98 dBm
- Typical receiver current consumption (3.6 V supply): 8.5 mA
- Transmitter current consumption (3.6 V supply, 0 dBm): 7.6 mA

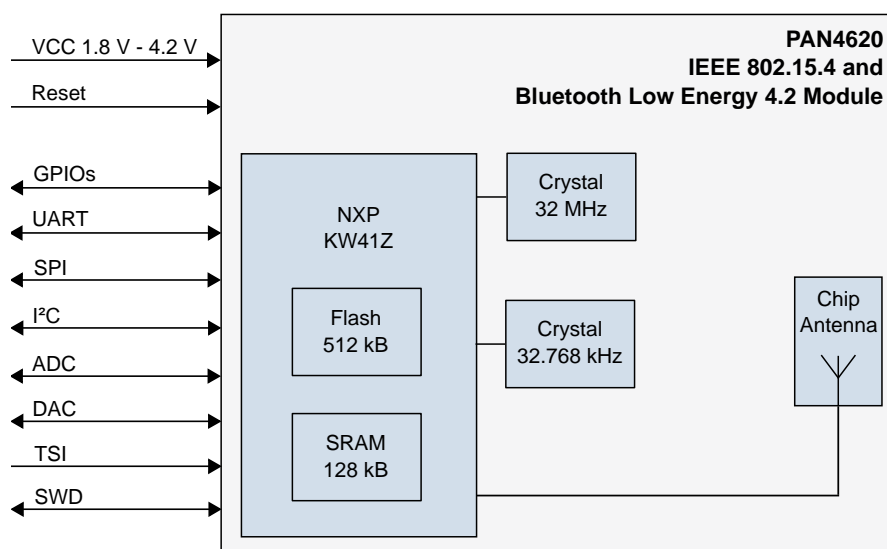
Bluetooth

- Bluetooth LE 4.2 compliant implementation certified by Bluetooth SIG
- Supporting software consisting of Bluetooth LE host stack and profiles and IPv6 over Bluetooth LE
- Bluetooth Developer Studio Plug-In

IEEE 802.15.4

- IEEE standard 802.15.4 compliant
- Supporting software consisting of 802.15.4 MAC/PHY implementation, Simple Media Access Controller (SMAC), and NXP's certified Thread® and Zigbee® stacks are available.

Block Diagram



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1 About This Document

1.1 Purpose and Audience




This Quick Start Guide applies to the IEEE 802.15.4 and Bluetooth Low Energy development platform PAN4620 USB. The intention is to enable our customers to easily integrate our module PAN4620 in their product. This guide describes the needed software and gives useful hints.

The product is referred to as “The PAN4620” or “the module” within this document.

1.2 Revision History

Revision	Date	Modifications/Remarks
0.1	2019-02-20	1st version

1.3 Use of Symbols

Symbol	Description
	Note Indicates important information for the proper use of the product. Non-observance can lead to errors.
	Attention Indicates important notes that, if not observed, can put the product's functionality at risk.
	Tip Indicates useful information designed to facilitate working with the PAN4620.
⇒ [chapter number] [chapter title]	Cross reference Indicates cross references within the document. Example: Description of the symbols used in this document ⇒ 1.3 Use of Symbols.
✓	Requirement Indicates a requirement that must be met before the corresponding tasks can be completed.
→	Result Indicates the result of a task or the result of a series of tasks.
This font	GUI text Indicates fixed terms and text of the graphical user interface. Example: Click Save .

Symbol	Description
Menu > Menu item	Path Indicates a path, e.g. to access a dialog. Example: In the menu, select File > Setup page .
This font	File names, messages, user input Indicates file names or messages and information displayed on the screen or to be selected or entered by the user. Examples: pan1760.c contains the actual module initialization. The message Failed to save your data is displayed. Enter the value Product 123.
[Key]	Key Indicates a key on the keyboard, e.g. [F10].

1.4 Related Documents

Please refer to the Panasonic website for more information as well as related documents

⇒ [6.2.2 Product Information](#).

2 Overview

The PAN4620 USB is a development platform for the PAN4620 IEEE 802.15.4 and Bluetooth Low Energy module to implement Bluetooth and IEEE 802.15.4 functionality into various electronic devices.

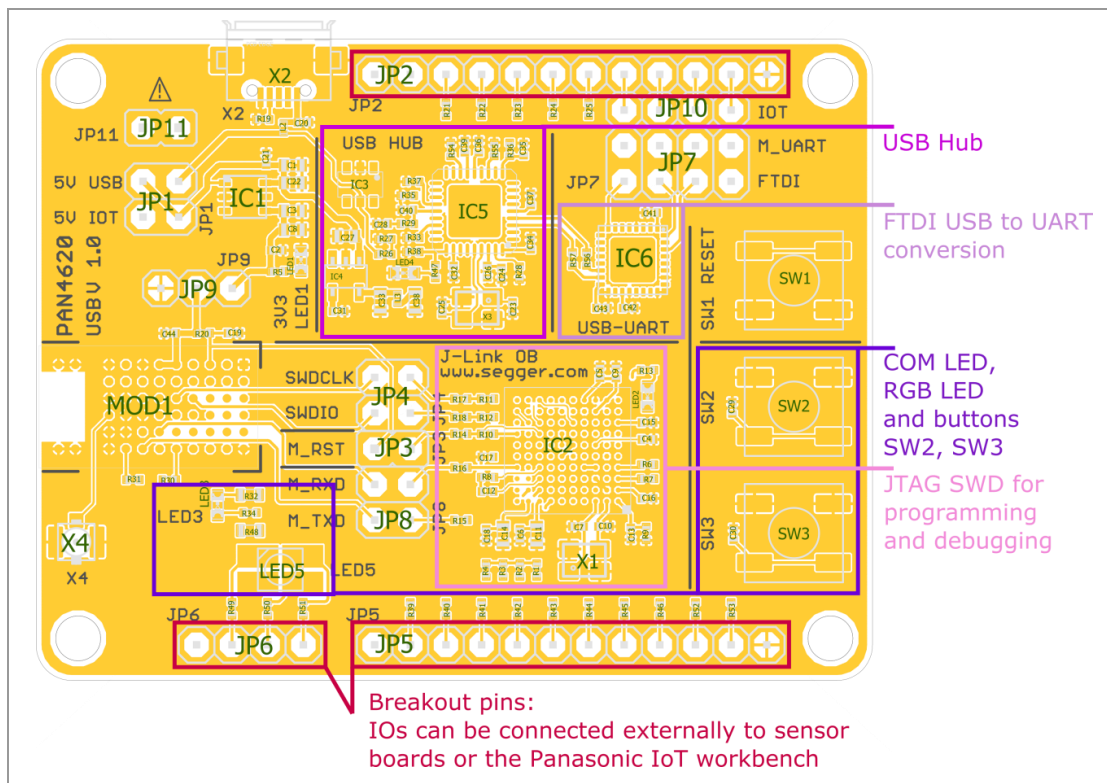
This guide will describe how to start up the Evaluation Board, get all needed software sources, execute example code and build own implementations.

Please refer to the Panasonic website for related documents ⇒ [6.2.2 Product Information](#).

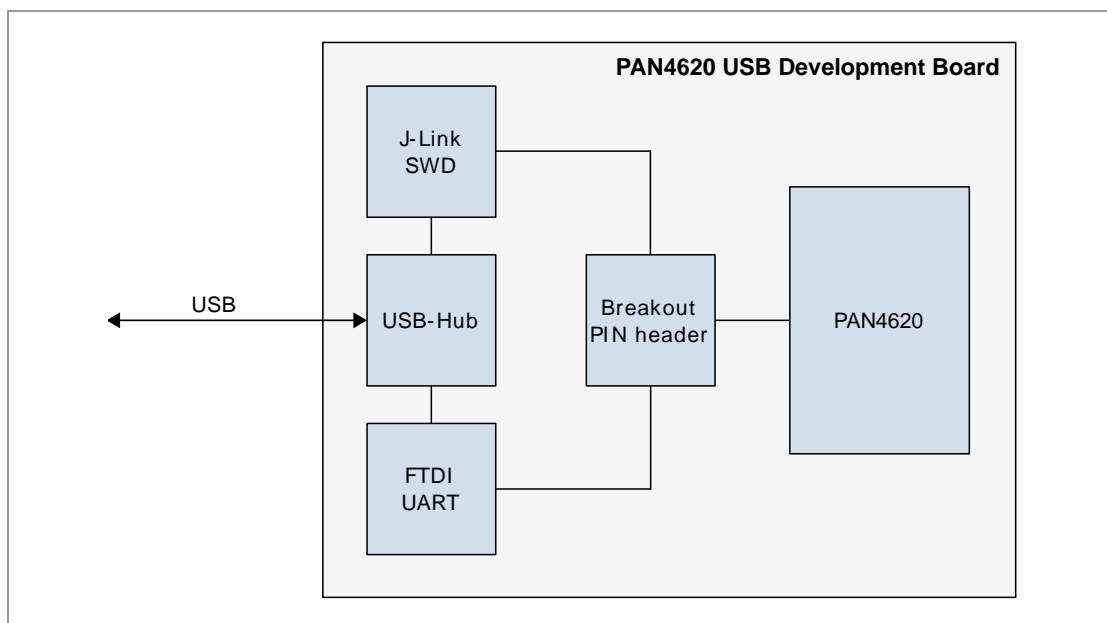
Further information on the variants and versions ⇒ [6.1 Ordering Information](#).

3 PAN4620 USB Evaluation-Board Overview

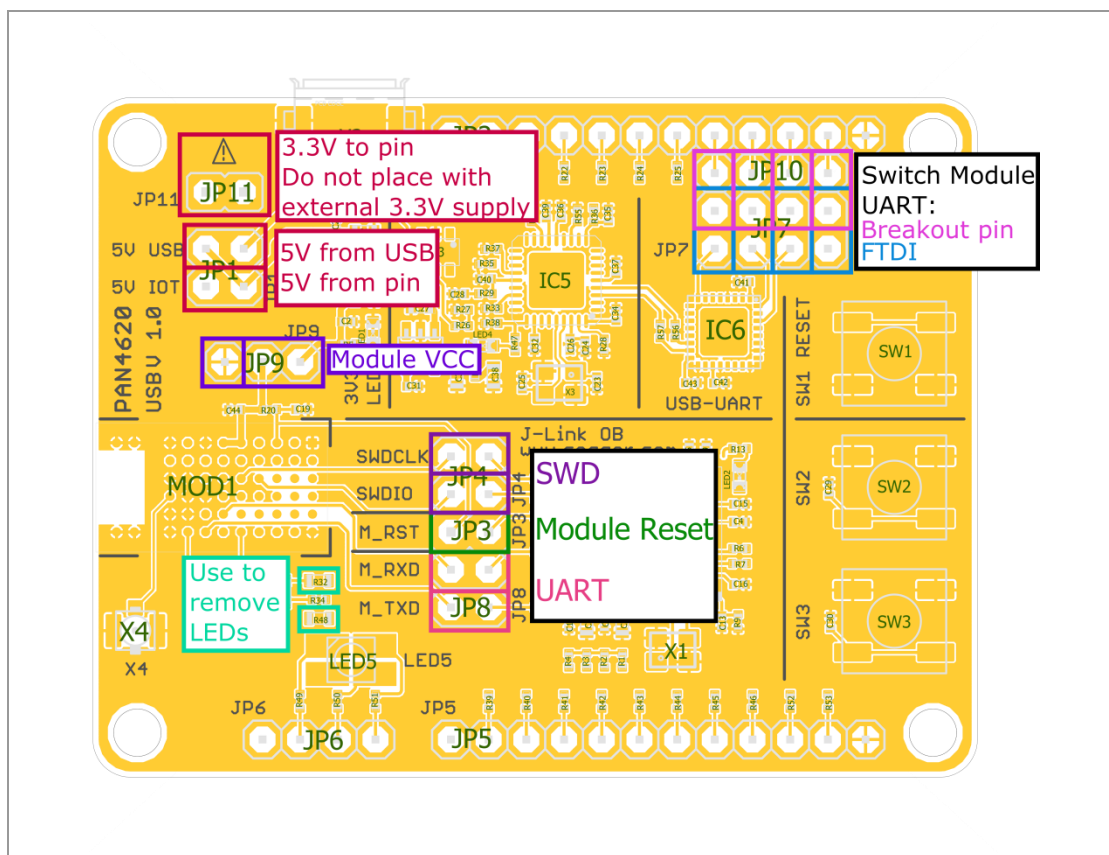
3.1 Building Block Overview



3.2 Architecture Overview


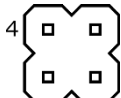



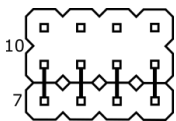
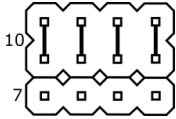





3.3 Breakout Pins



3.4 Configuration Settings

Jumper	Topview	Description	Detail
J1	1	5 V from USB connected	5 V power option, to power the board from USB or the 5 V pin. The 5 V from USB can also be used to power the sensor board.
	1	5 V from or to breakout pin connected	
J3	3	Module reset connected	If there is no firmware on the module, the reset will be pulled low. This has to be considered when the module is sharing a common reset with other components.
	3	Module reset disconnected	

Jumper	Topview	Description	Detail
J4		SWD connected	Access to module and programmer SWD.
		SWD disconnected	
J8		Module UART connected	Access to module UART RX and TX.
		Module UART disconnected	
J9		Module VCC connected	Module VCC connection and GND pin. The module VCC jumper can be removed for current measurements.
J7, J10		FTDI connected to module UART	Option for module UART to breakout pin or FTDI. Place jumpers either on J7 or J10.
		Breakout pin connected to module UART	
J11 		3.3 V are supplied to the breakout pin	Option to power an external sensor board sensor with 3.3 V. Do not place this jumper, if an external 3.3 V source is present.
		3.3 V are not supplied to the breakout pin	
R32, R48			These 0 Ω resistors can be removed, to disconnect the LEDs in case the IOs PTB0, PTC1, PTA18, and PTA19 shall be used for other purposes.
SW2, SW3			If you want to use PTC4 and PTC5 for other purposes, do not push the buttons.

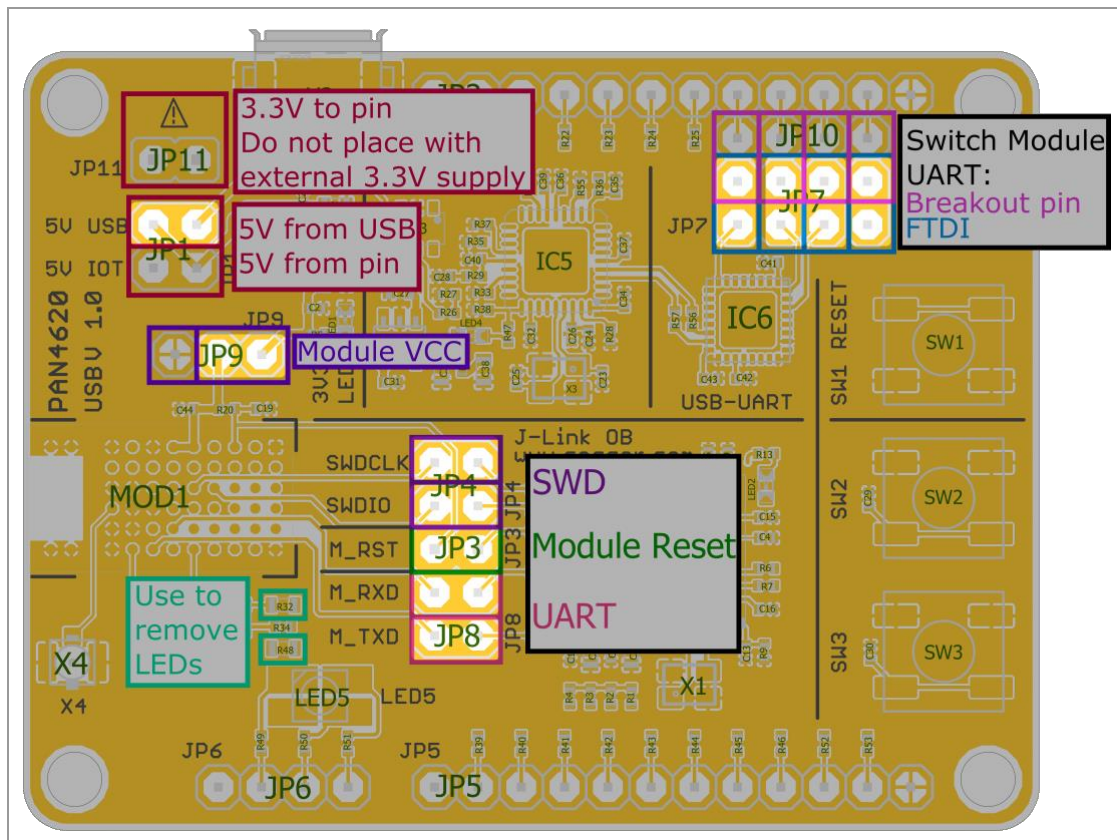


After each different configuration the reset button needs to be pressed.

4 Getting Started

4.1 Jumper Start up Configuration

Place all highlighted jumpers on PAN4620 Evaluation Board. Connect the device via USB cable to a PC, to power it and run demo examples in next step.

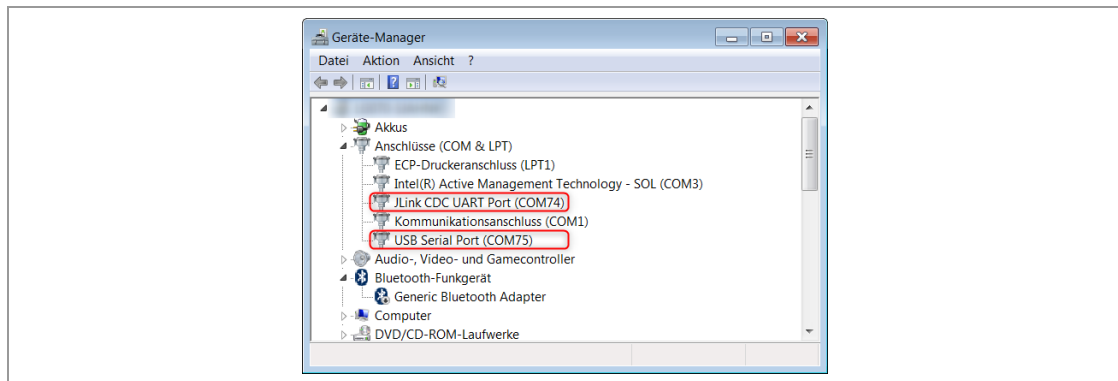


4.2 Device Drivers

4.2.1 General

It might be necessary to install drivers for some components.

Please note that the “FTDI USB UART” and the “Segger J-Link” SWD debugger will provide COM ports to the system.



On the PAN4620 USB Evaluation Board both COM ports, can be used to open a UART connection to the PAN4620 module.

4.2.2 FTDI USB UART



Having the drivers installed correctly is mandatory for all the examples mentioned in this Quick Start Guide.

Depending on the operating system that is used, drivers for the “FTDI USB UART” might not be installed automatically. If in doubt, please check the FTDI website and install the drivers manually.

For further information please visit <https://www.ftdichip.com/Drivers/VCP.htm>.

4.2.3 Segger J-Link SWD Debugger

Depending on the operating system that is used, drivers for “Segger J-Link” SWD debugger might not be installed automatically. Having the drivers installed correctly is not strictly mandatory for the basic example mentioned in this Quick Start Guide, but necessary for using other software examples from NXP SDK.


If in doubt, please check the “Segger” website and install the drivers manually.

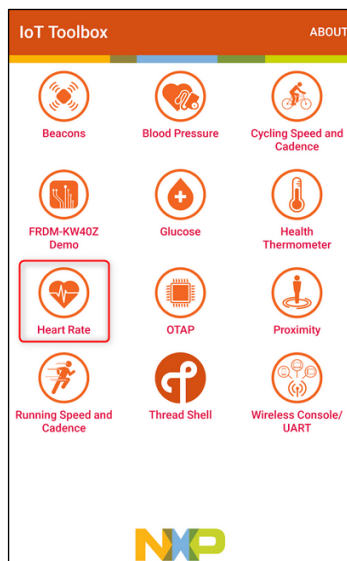
For further information please visit <https://www.segger.com/downloads/jlink/>.

4.3 Using Initial Bluetooth Heart Rate Example on PAN4620 USB

The PAN4620 Evaluation Board is coming with preinstalled Bluetooth Low Energy demo example.

Run the first demo

1. Download the app **IoT-Toolbox** from Google Play or Apple iTunes Store.
2. Start the app **IoT-Toolbox**.
3. Select the icon  **Heart Rate**.

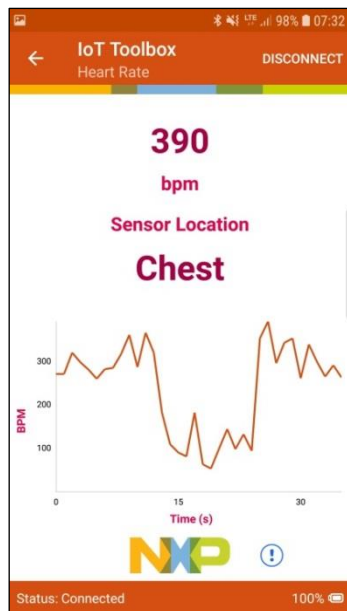


4. Switch on Bluetooth on Smartphone/Tablet.
5. Press the button **SW3** on PAN4620-ETU to start advertising.
6. Scan for devices on Smartphone/Tablet.
7. Select and connect to the found device (e.g. **FSL_HRS**).



8. Press the button **SW2** on the PAN4620-ETU to send changed heart rate data.

➔ See heart rate changes on Smartphone/Tablet.



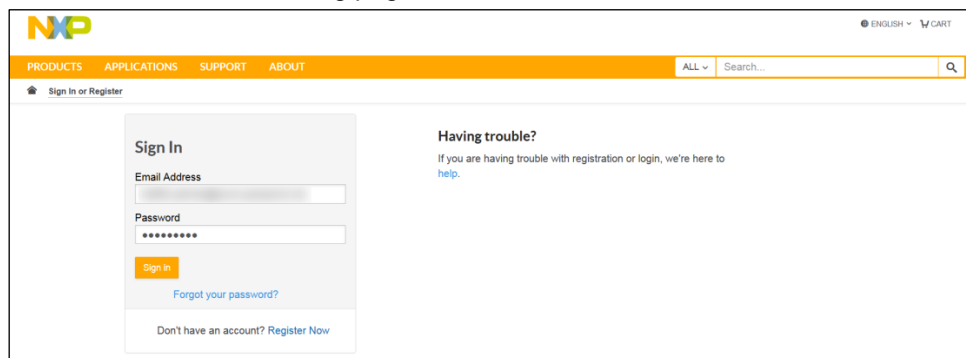
4.4 Getting NXP MCUXpresso IDE for PAN4620 Module

The following requirements must be met:

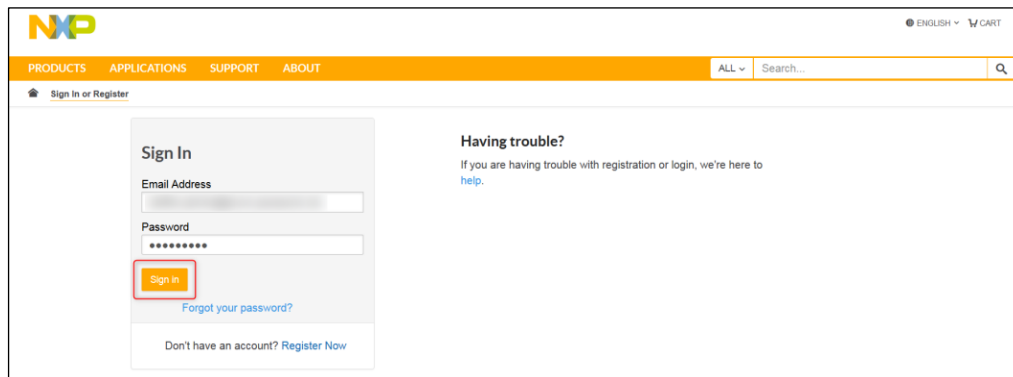
- ✓ Created user account on NXP website

1. Visit the website www.nxp.com.
2. Search for MCUXpresso Integrated Development Environment (IDE).
3. Click **download**.

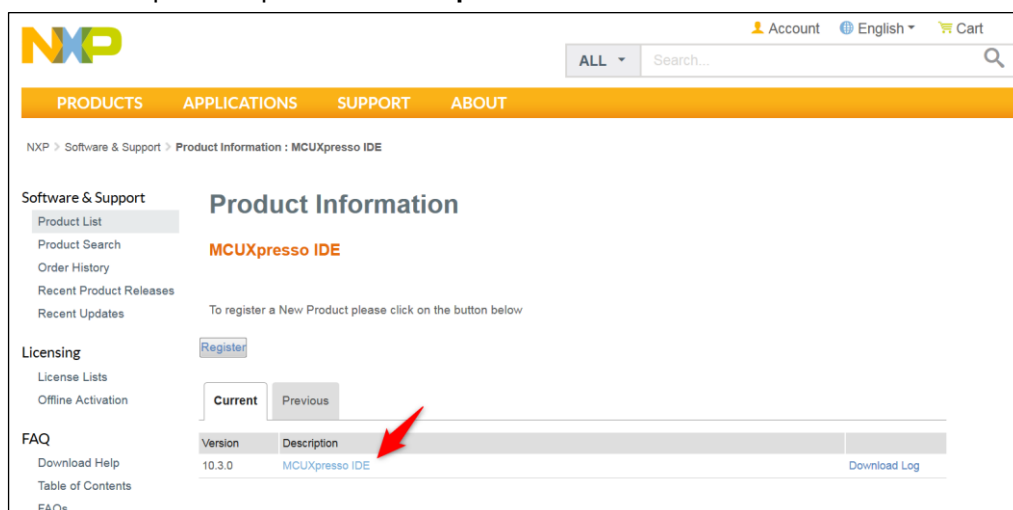
➔ NXP will lead to the following page.



4. Click **Sign in**.



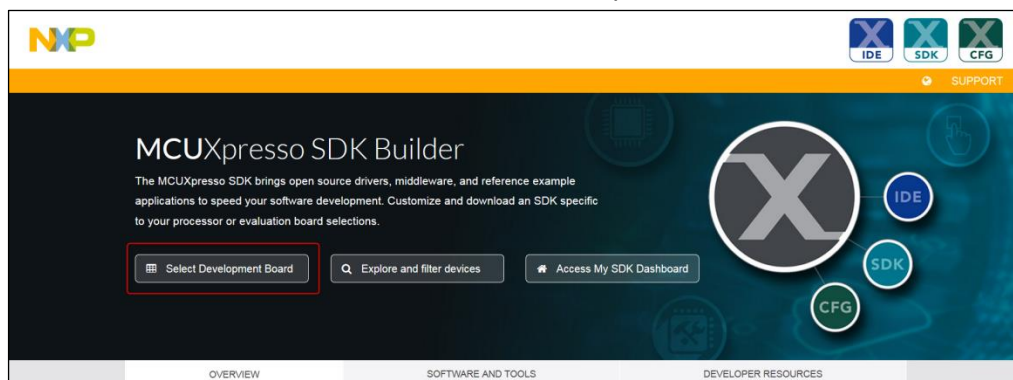
5. Download a previous preferred **MCUXpresso IDE** version and install the IDE.



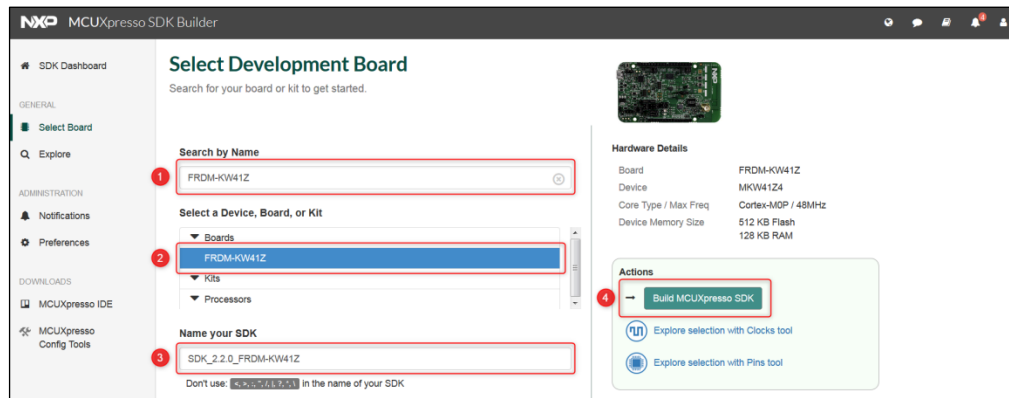
4.5 Getting NXP SDK for PAN4620 Module

Getting necessary sources for software development

1. Visit the website www.nxp.com.
2. Search for MCUXpresso SDK Builder.
3. Click **Select Development Board** to search for the correct board or kit to get started.
The PAN4620-ETU is based on the FRDM-KW41Z platform from NXP.



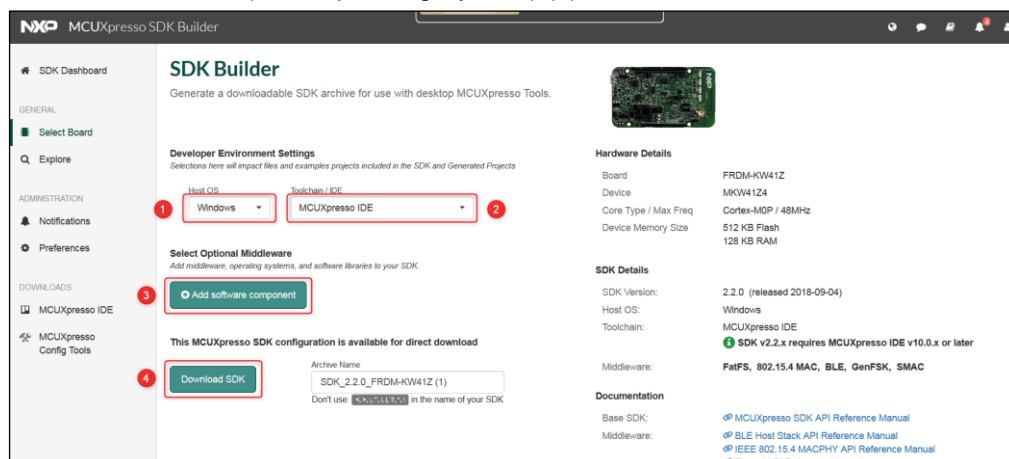
4. Enter FRDM-KW41Z to the field **Search by Name** (1).



5. Select the found board (2).
6. Enter a preferred name for the SDK (3).
7. Click on **Build MCUXpresso SDK** (4).

Generate a downloadable SDK archive for use with desktop MCUXpresso tools

1. Select the **Host OS** (Host Operating System) (1).



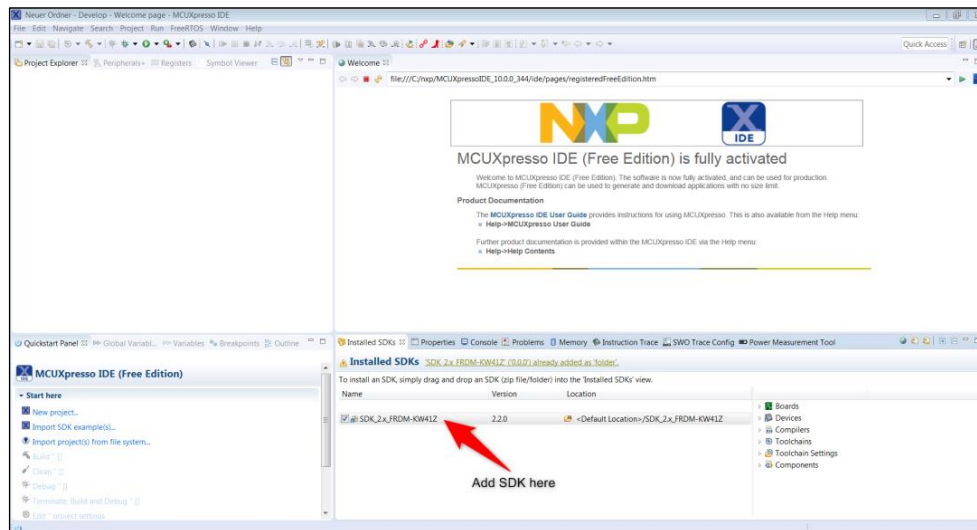
2. Select the preferred **Toolchain / IDE** (2).
3. Click **Add software component** (3) and select optional Middleware.
Available are Middleware like CMSIS DSP Lib, FatFS, mbedTLS, NTAG I2C, wolfssl, FreeRTOS operating system and wireless stacks like 802.15.4 MAC, Bluetooth LE, GenFSK, SMAC, Thread and Zigbee.
4. Click **Download SDK** (4).

4.6 Using SDK in MCUXpresso IDE

To get access to the sources in the SDK, it is necessary, to link the SDK to the IDE.

1. Open **MCUXpresso IDE**.
2. Unzip the SDK.

3. Pull the folder (zipped or unzipped) into the tab **Installed SDKs** in **MCUXpresso IDE**.

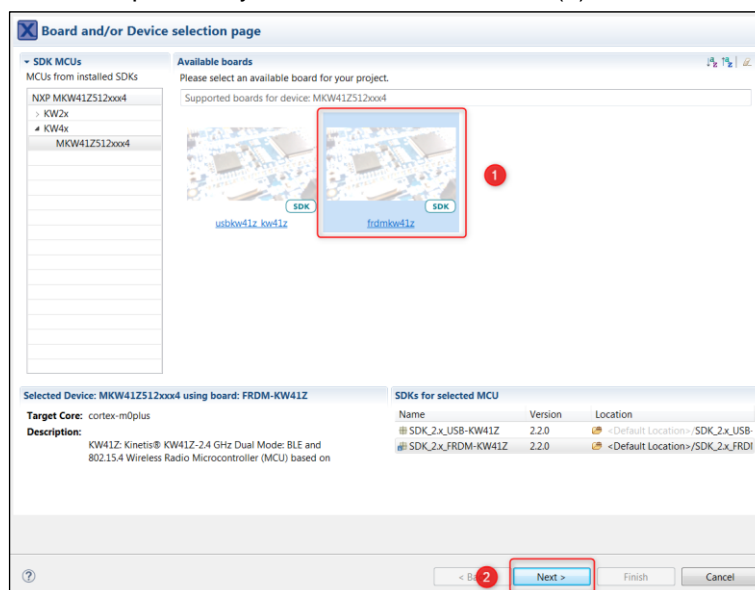


For further information about getting started with the API, the middleware and all the examples for wireless stacks, see the documentation folder in the SDK (SDK_2.2.0_FRDM-KW41Z > docs).

Open and run Software Example from SDK

Open the software

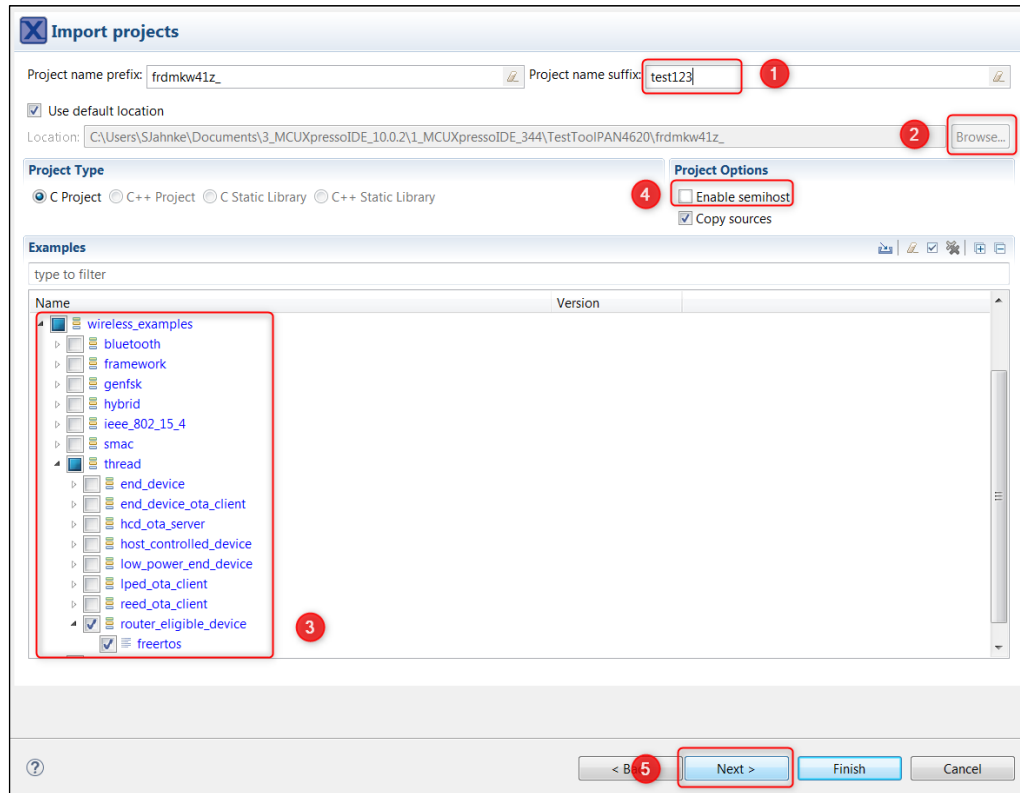
1. Click the field **Import SDK example(s)** in the **Quickstart Panel** of the **MCUXpresso IDE**.
2. Select the previously loaded SDK **frdmkw41z** (1).



3. Click **Next >** (2).

Run the software

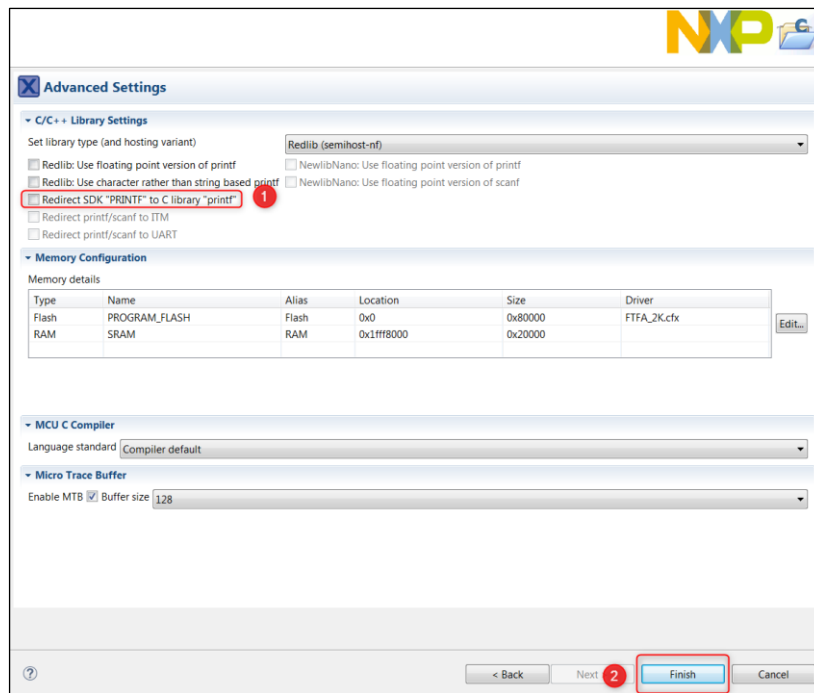
1. Select the preferred example for running a demo.
2. Enter a **Project name suffix** (1) to distinguish between different programs in the workspace.



3. Click **Browse** (2) to select the location for the project (usually, the predefined workspace).
We will select the **wireless_examples > thread > router_eligible_device > freertos** (3) example to show a Thread network demonstration.
4. Uncheck the box **Enable semihost** (4) to control the device by using an external terminal program like HTerm.
5. Click **Next >** (5).

Advanced Settings

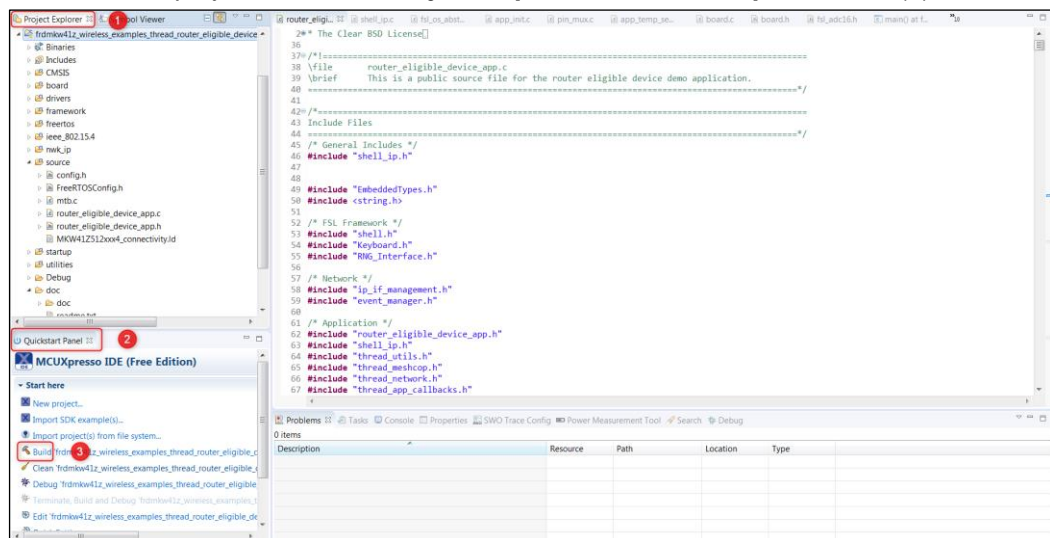
1. Uncheck the box **Redirect SDK "PRINTF" to C library "printf"** (1).



2. Click **Finish** (2).

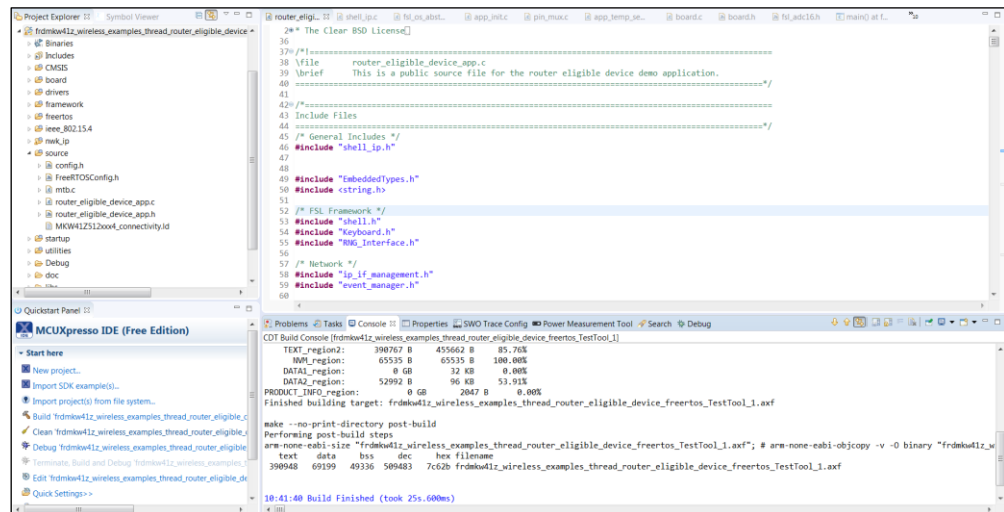
Compile the example project

1. Click onto the project inside the **Project Explorer** within **MCUXpresso IDE** (1).





2. Click the Build icon (3) in **Quickstart Panel** (2) or **Toolbar**, to compile the example project.

➔ MCUXpresso IDE after loading the example demo from SDK.

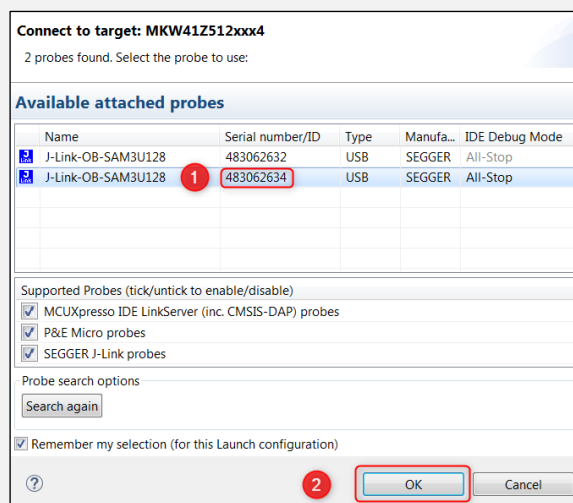


Flash the software

1. Connect the PAN4620 Evaluation Board to the PC.
2. Click the Debug icon .
 - ➔ The software will be flashed with the onboard **J-Link-OB-SAM3U128** to the PAN4620 module.
3. Click the Start icon  in the toolbar, to run the application on the PAN4620 Evaluation Board.



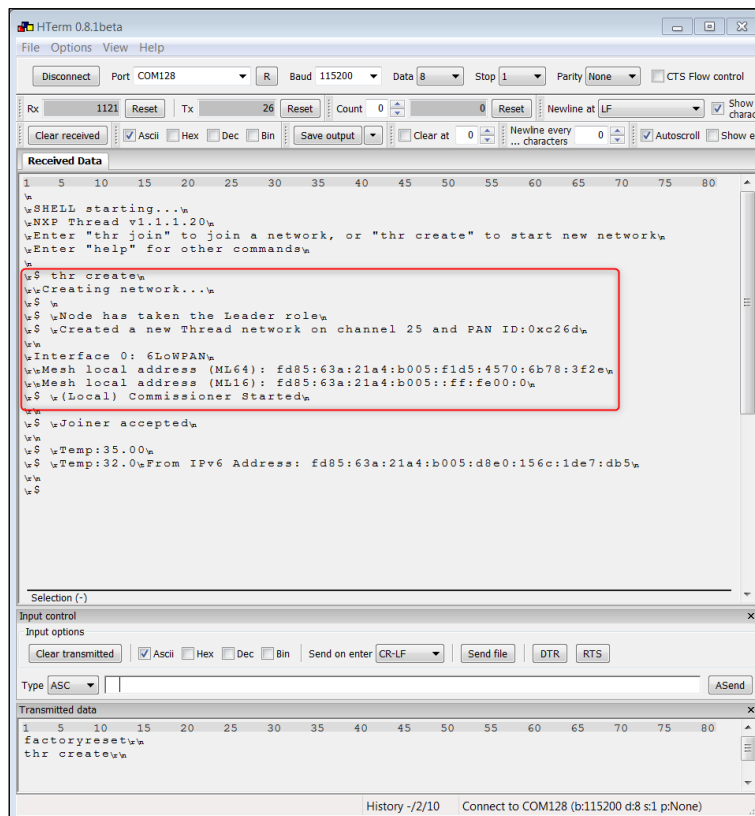
In case of more than one connected PAN4620 boards, the IDE will give the possibility, to choose which should be flashed. Compare the **Segger Serial number/ID** (1) with the label on the bottom of the PAN4620 board. Click **OK** (2).



Use the Thread Application

Flash at least two of the PAN4620 Evaluation Boards with this software.

1. Open two terminal programs like **HTerm** and connect to the COM ports of both nodes.
Use the serial configurations for the nodes (like the figures below will show).
2. On the first node enter the command `thr create` and press [Enter].
→ Wait till the node has created the Thread network (here with the ID `0xc26d`).



```
File Options View Help
Disconnect Port COM128 Baud 115200 Data 8 Stop 1 Parity None CTS Flow control
Rx 1121 Tx 26 Count 0 Reset Newline at LF Show r
Clear received [x] Ascii [x] Hex [ ] Dec [ ] Bin [ ] Save output [ ] Clear at 0 Newline every ... characters [ ] Autocroll [ ] Show er
Received Data
1 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80
wSHELL starting...w
wNXP Thread v1.1.1.20w
wEnter "thr join" to join a network, or "thr create" to start new networkw
wEnter "help" for other commandsw
w$ thr createw
wCreating network...w
w$ w
wNode has taken the Leader rolew
wCreated a new Thread network on channel 25 and PAN ID:0xc26dw
ww
wInterface 0: 6LoWPANw
wMesh local address (ML64): fd85:63a:21a4:b005:f1d5:4570:6b78:3f2ew
wMesh local address (ML16): fd85:63a:21a4:b005:ff:fe00:0w
w$ w(Local) Commissioner Startedw
w$ wJoiner acceptedw
ww
w$ wTemp:35.00w
w$ wTemp:32.0wFrom IPv6 Address: fd85:63a:21a4:b005:d8e0:156c:1de7:db5w
w$
Selection (-)
Input control
Input options
Clear transmitted [x] Ascii [x] Hex [ ] Dec [ ] Bin [ ] Send on enter CR-LF [ ] Send file [ ] DTR [ ] RTS [ ]
Type ASC [ ] [ ] ASend
Transmitted data
1 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80
factoryresetw
thr createw
History -/2/10 Connect to COM128 (b:115200 d:8 s:1 p:None)
```

3. On the second node enter the command `thr join` and press [Enter].

- ➔ The node will search for existing Thread networks (RGB LED5 will change colors fast) and connect to the previously created network automatically.

```

HTerm 0.8.1beta
File Options View Help
Disconnect Port COM111 Baud 115200 Data 8 Stop 1 Parity None CTS Flow control
Rx 882 Reset Tx 24 Reset Count 0 0 Reset Newline at LF Show charact
Clear received [x] Ascii [x] Hex [ ] Dec [ ] Bin [ ] Save output [ ] Clear at 0 Newline every ... characters [x] Autocroll [ ] Show er
Received Data
1 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80
w
wSHELL starting...w
wNXP Thread v1.1.1.20w
wEnter "thr join" to join a network, or "thr create" to start new networkw
wEnter "help" for other commands
wS thr joinw
wJoining network...w
wS wCommissioning successfulw
w
wS wAttached to network with PAN ID: 0xc26d w
wTemp:35.0wFrom IPv6 Address: fd85:63a:21a4:b005:f1d5:4570:6b78:3f2ew
w
wS wTemp:32.00w
wS
Selection (-)
Input control
Input options
Clear transmitted [x] Ascii [x] Hex [ ] Dec [ ] Bin [ ] Send on enter CR-LF [ ] Send file [ ] DTR [ ] RTS [ ]
Type ASC [ ]
Transmitted data
1 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80
factoryresetw
thr joinw
History -/2/10 Connect to COM111 (b:115200 d:8 s:1 p:None)
  
```

4. Press the button **SW2** on both PAN4620-ETU nodes, to change the color of the RGB LEDs on both nodes.

➔ Thread network is working.

5. Press the button **SW3**.

➔ Everything, within the software, is prepared and implemented, to exchange the measured temperature between the nodes.

```

HTerm 0.8.1beta
File Options View Help
Disconnect Port COM128 Baud 115200 Data 8 Stop 1 Parity None CTS Flow control
Rx 882 Reset Tx 24 Reset Count 0 0 Reset Newline at LF Show charact
Clear received [x] Ascii [x] Hex [ ] Dec [ ] Bin [ ] Save output [ ] Clear at 0 Newline every ... characters [x] Autocroll [ ] Show er
Received Data
1 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80
wSHELL starting...w
wNXP Thread v1.1.1.20w
wEnter "thr join" to join a network, or "thr create" to start new networkw
wEnter "help" for other commands
wS thr createw
wCreating network...w
wS wNode has taken the leader rolew
wS wCreated a new Thread network on channel 25 and PAN ID:0xc26d w
w
wIntercom 0: fd85:63a:21a4:b005:f1d5:4570:6b78:3f2ew
wMesh local address (ML16): fd85:63a:21a4:b005:ff:fe00:0w
wS w(leader) Commissioning Startedw
wS wJoiner acceptedw
wS wTemp:35.00w
wS wTemp:32.0wFrom IPv6 Address: fd85:63a:21a4:b005:d80:156c:1de7:db5w
w
wS
Selection (-)
Input control
Input options
Clear transmitted [x] Ascii [x] Hex [ ] Dec [ ] Bin [ ] Send on enter CR-LF [ ] Send file [ ] DTR [ ] RTS [ ]
Type ASC [ ]
Transmitted data
1 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80
factoryresetw
thr createw
History -/2/10 Connect to COM128 (b:115200 d:8 s:1 p:None)

HTerm 0.8.1beta
File Options View Help
Disconnect Port COM111 Baud 115200 Data 8 Stop 1 Parity None CTS Flow control
Rx 882 Reset Tx 24 Reset Count 0 0 Reset Newline at LF Show charact
Clear received [x] Ascii [x] Hex [ ] Dec [ ] Bin [ ] Save output [ ] Clear at 0 Newline every ... characters [x] Autocroll [ ] Show er
Received Data
1 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80
wSHELL starting...w
wNXP Thread v1.1.1.20w
wEnter "thr join" to join a network, or "thr create" to start new networkw
wEnter "help" for other commands
wS thr joinw
wJoining network...w
wS wCommissioning successfulw
w
wS wAttached to network with PAN ID: 0xc26d w
wTemp:35.0wFrom IPv6 Address: fd85:63a:21a4:b005:f1d5:4570:6b78:3f2ew
w
wS wTemp:32.00w
wS
Selection (-)
Input control
Input options
Clear transmitted [x] Ascii [x] Hex [ ] Dec [ ] Bin [ ] Send on enter CR-LF [ ] Send file [ ] DTR [ ] RTS [ ]
Type ASC [ ]
Transmitted data
1 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80
factoryresetw
thr joinw
History -/2/10 Connect to COM111 (b:115200 d:8 s:1 p:None)
  
```



Get more information about the possibilities and commands, in Thread networks, with the commands `help` and `help thr`.

Take care that there is always a **CR-LF** sign at the drop down menu **send on enter** in the section **Input control** of **HTerm** or similar terminal programs.



Please note that there is no thermistor mounted on the PAN4620-ETU. Just the software is prepared for this use case. To measure a correct temperature, it is recommended, to use the “thermistor measuring circuit” shown in “FRDM-KW41Z Freedom Development Board User's Guide” (in chapter “Thermistor”).



The chosen Thread software example gives additionally the possibility, to use touch sensitive inputs on the Pins “PTC16 (TSI0_CH4)” and “PTC17 (TSI0_CH5)”. If PAN4620 Evaluation Board is delivered with already mounted pin headers for “JP2” and “JP5”, notice that these inputs can detect the human body by contact and affect the software.

5 Restricted Use

5.1 Life Support Policy

This Panasonic Industrial Devices Europe GmbH product is not designed for use in life support appliances, devices, or systems where malfunction can reasonably be expected to result in a significant personal injury to the user, or as a critical component in any life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

Panasonic customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Panasonic Industrial Devices Europe GmbH for any damages resulting.

5.2 Restricted End Use

This Panasonic Industrial Devices Europe GmbH product is not designed for any restricted activity that supports the development, production, handling usage, maintenance, storage, inventory or proliferation of any weapons or military use.

Transfer, export, re-export, usage or reselling of this product to any destination, end-user or any end-use prohibited by the European Union, United States or any other applicable law is strictly prohibited.

6 Appendix

6.1 Ordering Information

Variants and Versions

Order Number	Brand Name	Description	MOQ
ENWC9B01AQEF	PAN4620-ETU	USB Evaluation Board	1
ENWC9B01A1EF	PAN4620	PAN4620 Module	1 500

6.2 Contact Details

6.2.1 Contact Us

Please contact your local Panasonic Sales office for details on additional product options and services:

For Panasonic Sales assistance in the **EU**, visit

<https://eu.industrial.panasonic.com/about-us/contact-us>

Email: wireless@eu.panasonic.com

For Panasonic Sales assistance in **North America**, visit the Panasonic website “Sales & Support” to find assistance near you at

<https://na.industrial.panasonic.com/distributors>

Please visit the **Panasonic Wireless Technical Forum** to submit a question at

<https://forum.na.industrial.panasonic.com>

6.2.2 Product Information

Please refer to the Panasonic Wireless Connectivity website for further information on our products and related documents:

For complete Panasonic product details in the **EU**, visit

<http://pideu.panasonic.de/products/wireless-modules.html>

For complete Panasonic product details in **North America**, visit
<http://www.panasonic.com/rfmodules>