Panasonic
INDUSTRY

IN Your Future

Your Committed Enabler

Next generation Bluetooth 6

PAN B511-1 Module based on nRF54L15

November 4th, 2024

Panasonic Industry Europe GmbH

EMCBD Product Management

Agenda

01

Introduction to Bluetooth 6

WHAT‘S NEW IN BLUETOOTH 6?

What‘s new in Bluetooth 6?

Bluetooth® Core Specification version 6.0

1. Bluetooth Channel Sounding
   (Secure fine-ranging) — **Highlight**
2. Decision-Based Advertising Filtering
   (Increased efficiency of scanning devices with extended advertising)
3. Monitoring Advertisers
   (Enhanced device discovery and connection establishment)
4. ISOAL Enhancement
   (Low-latency isochronous data transimission)
5. Link Layer Extended Feature Set
   (Accommodates the growing number of BLE features and improves interoperability)
6. Frame Space Update
   (Improved efficiency and better coexistence)

Channel Sounding: Secure fine-ranging

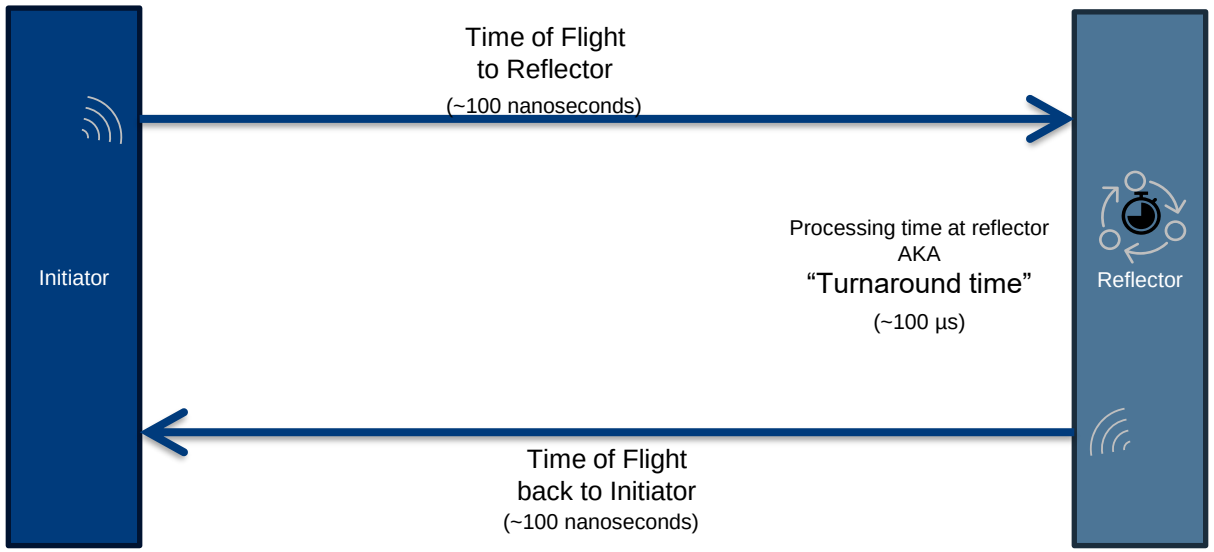
A new "1-to-1" technology

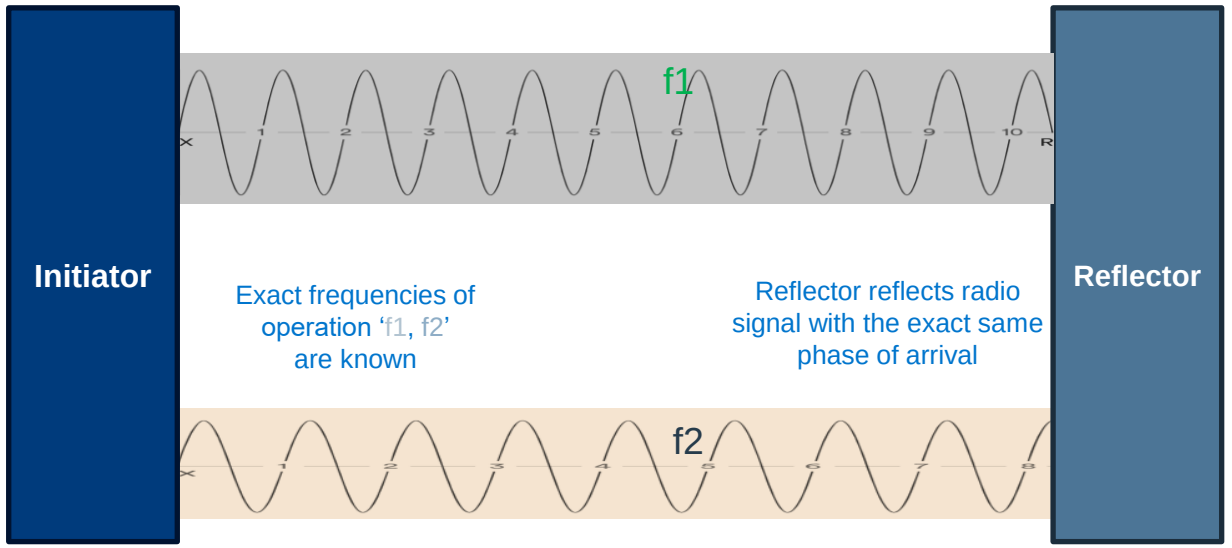
*to provide "**true distance awareness**" between two BLE devices*

- Reliably measure distance **up to 150 meters**
- CS doesn't interfere on LE Primary advertising channels
- Channel filtering promotes use of channels with best RF conditions
- Enhances security against physical layer / side-channel attacks

Usage of of two distinct distance measurement methods:

Round-Trip Timing (RTT) + **Phase-Based Ranging (PBR)**





Channel Sounding: Key Application Areas

Secure presence verification

Find my

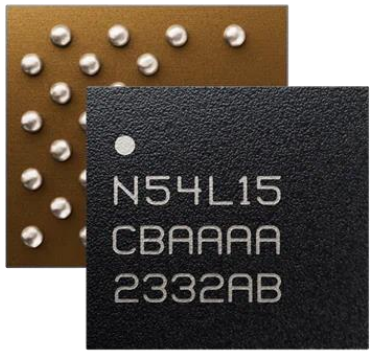
Access Control

02

nRF54L15 SoC

NORDIC‘S NEXT LEVEL ULTRA-LOW-POWER SOC

Key features of the nRF54L15



Increased processing performance and efficiency

22nm

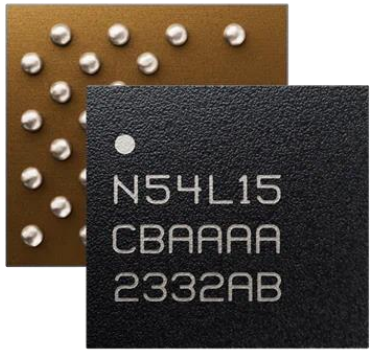
Process node

Advanced security services

Improved radio robustness, range and efficiency

Bluetooth® matter THREAD zigbee

Technical specification of the nRF54L15



- **High processing power:** 128 MHz Arm Cortex-M33 processor
- **Expanded memory:** 1.5 MB non-volatile memory & 256 KB RAM
- **High performance Radio**: 8 dBm TX power and -98 dBm RX sensitivity for 1 Mbps Bluetooth Low Energy
- **Multiprotocol radio:** Bluetooth Low Energy, Bluetooth mesh, Zigbee, Thread, and Matter
- **New peripherals:** Global RTC, 14-bit ADC, and a software-defined peripheral enabled by a RISC-V coprocessor
- **Improved Security:** Designed for PSA Certified Level 3 IoT security standard, TrustZone isolation, side-channel protection, and tamper detection
- **Bluetooth 6.0 Support**

03

PAN B511-1: Next generation BLE Module

POWERED BY NRF54L15

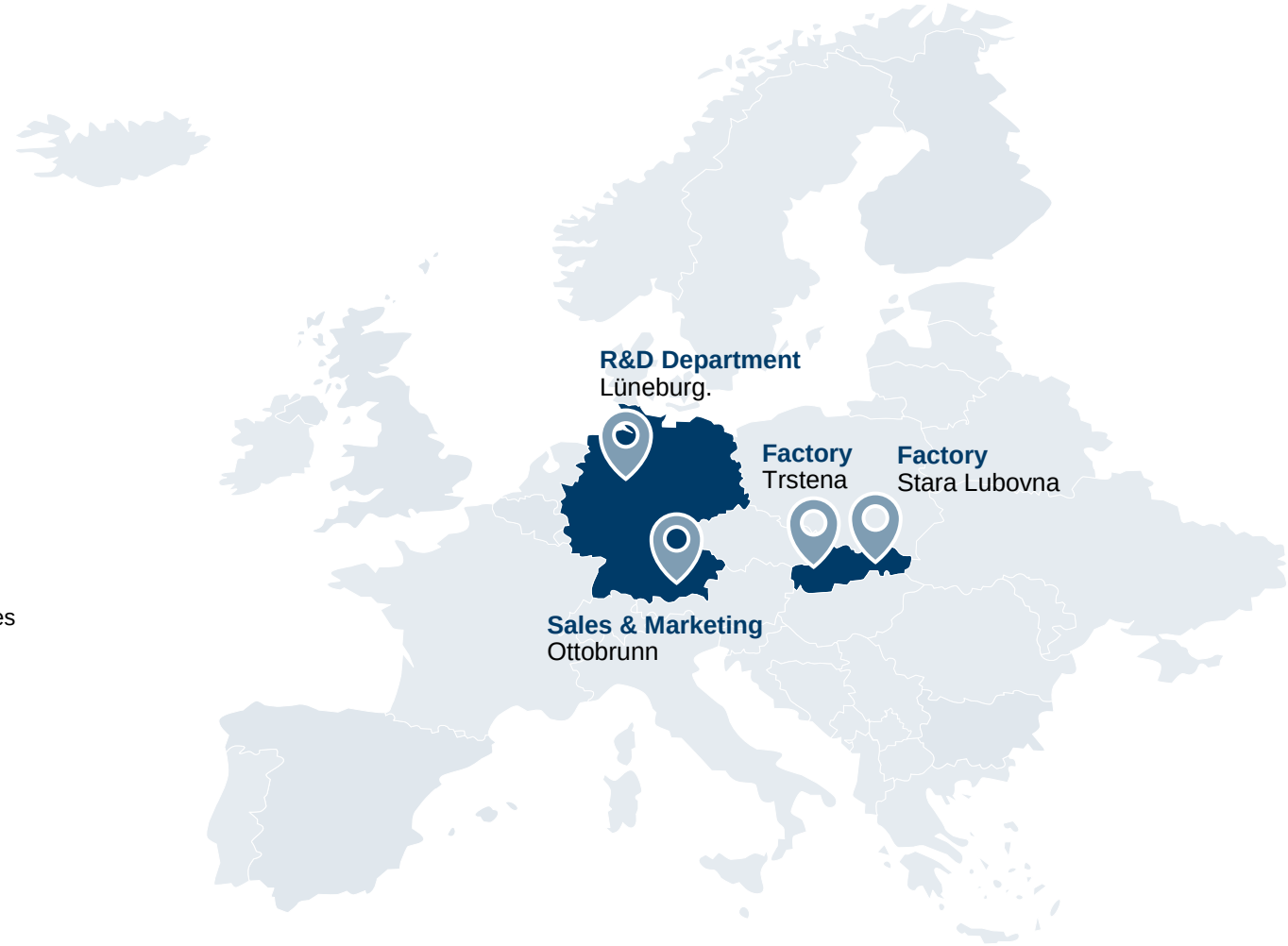
Wireless Modules from the heart of Europe

Lüneburg
Wireless Modules Headquarter
Development, Lifetime tests
Employees: ca. 500

Stara Lubovna
Production of Wireless Modules
Panasonic own factory
Employees: ca. 1000

Trstena
Emergency factory for Panasonic Wireless Modules
Panasonic own factory
Employees: ca. 1500

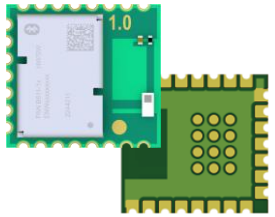
Ottobrunn
Sales & Marketing Headquarter
Employees: ca. 500



>> Local point of contact & local production with direct shipment within a few days <<

PAN B511-1: Next generation Bluetooth 6 Module

NORDIC SEMICONDUCTOR nRF54L15	
Host, Standalone	Nordic SDK
ARM Cortex-M33 @128 MHz	
1,5 MB *Flash*	256 kB *RAM*
+8 dBm *output power*	-98 dBm *sensitivity*
Chip *antenna*	
10.35 x 9.8 x 1.9 [mm] *size*	



Hybrid Footprint Layout
(Castellated Holes and LGA)

Small size
(All 32 GPIOs available!)

Different Spec variants available

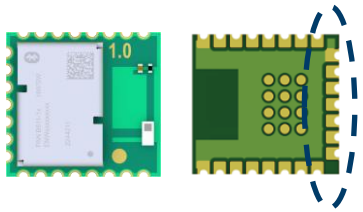
PAN-MaX PAN-MaX Matter service compatible

Planned Certifications:

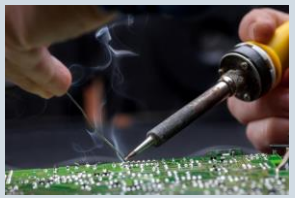
CE RED | UKCA | FCC | ISED | MIC

(more on request)

Benefits of castellated holes

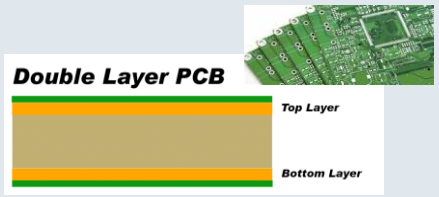


Should you use only castellated holes?



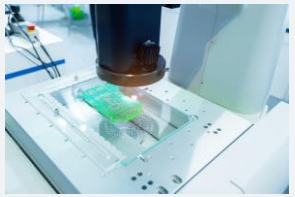
Hand soldering

During prototyping phase, the module can be soldered on the carrier PCB by hand.



Double layer designs possible

By using only the castellated holes of the module, a double layer PCB can be used, eliminating the need for vias and costly multi layer boards.



Optical outgoing inspection

In production, expensive x-ray machines for solder joint checks are no longer necessary and can be replaced by cheaper optical processes.

3 Spec variants planned

	PAN B511-1C Economy	PAN B511-1C Standard	PANB511-1C Premium
Antenna	Chip	Chip	Chip
Slow Clock Crystal		Yes	Yes
Additional Flash Memory (4 MB)			Yes

Target Applications


(Smart) Lighting


White goods


Industrial Sensors


Medical Device


Wearables


Energy Management


Machine Learning

matter

Module Comparison: PAN1780/70 vs PAN B511-1x

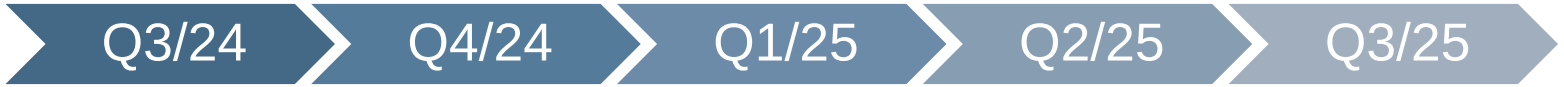
	PAN1780	PAN B511-1
SoC	nRF52840	nRF54L15
Core	Cortex M4F @ 64MHz	Cortex M33 @ 128MHz
Output Power	+8dBm	+8dBm
Flash Memory	1 MB	1,5 MB
GPIOs	48	32
PSA Level	1	3
Size [mm]	15.6 x 8.7 x 2.0	10.35 x 9.6 x1.9

PAN B511-1x is a cost effective, small size module with great performance!

PAN B511-Roadmap

PAN B511-1C

Bluetooth 5.4
nRF54L15



04

Evaluation & Development Tools

Hardware Development

Easy Evaluation with the PAN B511-1 EVB

First Boards availabe in beginning of 2025

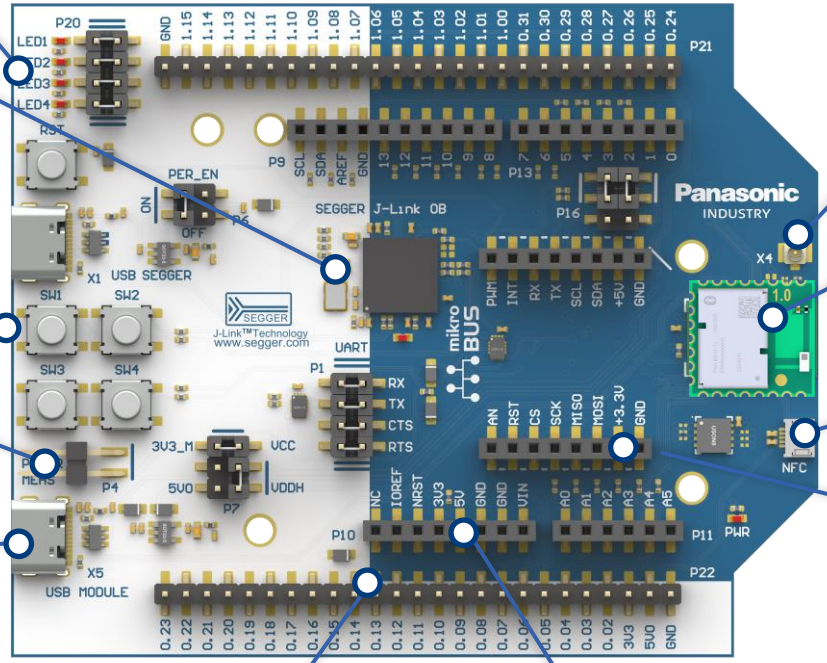
User LEDS

Segger J-Link
on-board Debugger

4 User Buttons

Current Measurement Pins

Native USB Support



uFL connector

PAN B511-1C module

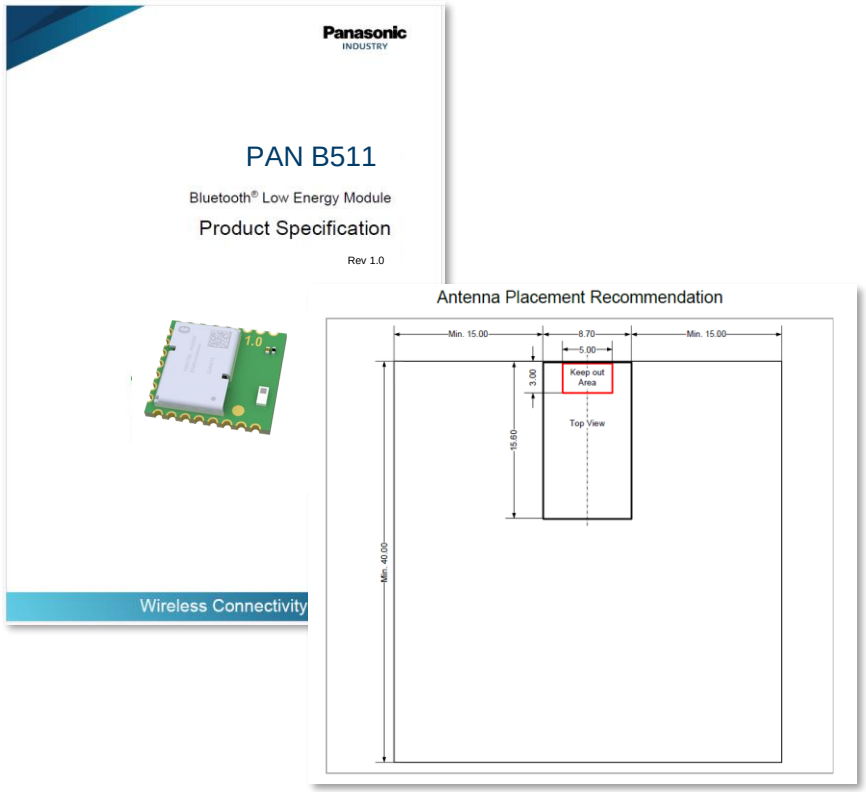
NFC antenna connector

MikroE header

Access to all module GPIOs

Arduino UNO R3 header
(Master & Slave mode)

Easy integration with Panasonic‘s design recommendation!



Included Design Recommendations:

- Placement of the module
- Information on the needed GND Area
- Information on the cut-out Area
- Pin out information
- Placement of surrounding high frequency components

The design recommendations can be found in the upcoming PAN B511-1 Product Specification!

Software Development

Software Tools for development

nRF Connect SDK

Based on Zephyr™ Project

- Standard SDK for Nordicbased modules
- Ideal for multiprotocol
- Strong community support
- Qualified Bluetooth LE Stack
  (supporting upcoming Bluetooth 6.0)
- Extensive samples, libraries and modules

Toolchain for Software Development:

Editor: VS Code

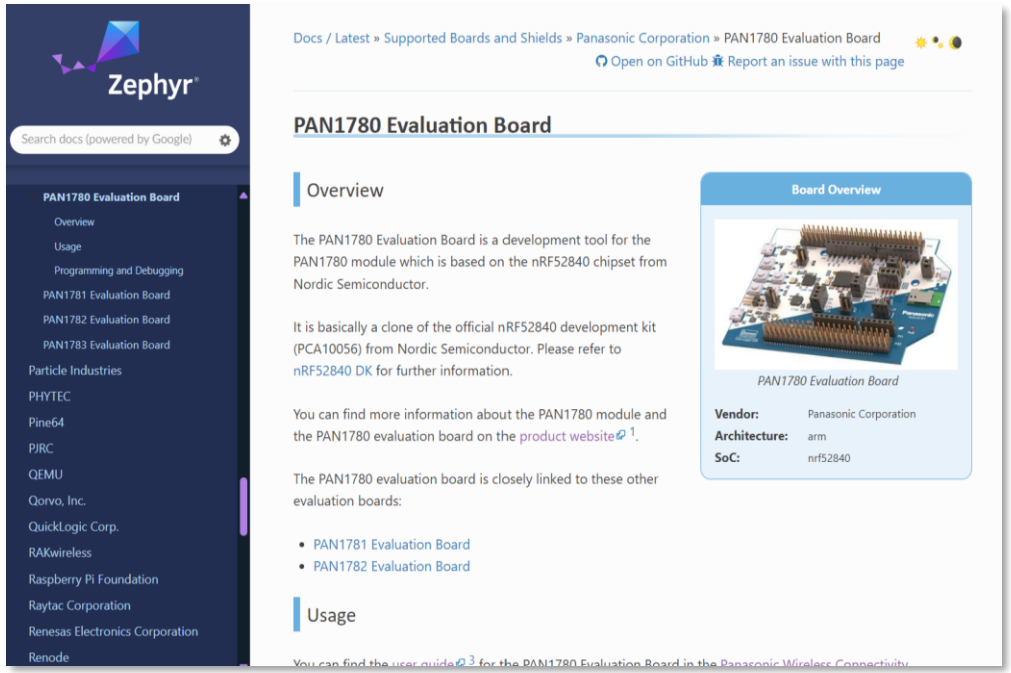
VS Extention: nRF Connect for VS Code

- Includes nRF Connect SDK for Developing, Building, Debugging etc.

Tools included in the nRF Connect for VS Code:

- nRF Util (Repository manager)
- Kconfig (Project configuration)
- Device Tree (Hardware configuration)
- nRF Terminal
- Toolchain manager
- And many more

PAN B511-1 EVB will be included in nRF Connect SDK!

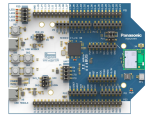


- Existing Panasonic modules are embedded as target devices in the Zephyr Project (e.g. PAN1780, PAN1783)
- PAN B511-1 EVB will follow as target device

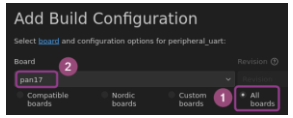
➔Existing sample codes can run on the PANB511 either without or few modifications.

How to start project in VS Code:

1. Select an existing sample from the nRF Connect SDK.

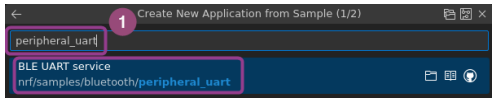


2. Select the PAN B511 EVB as target device.



3. Flash the Board with the application.

4. Done.



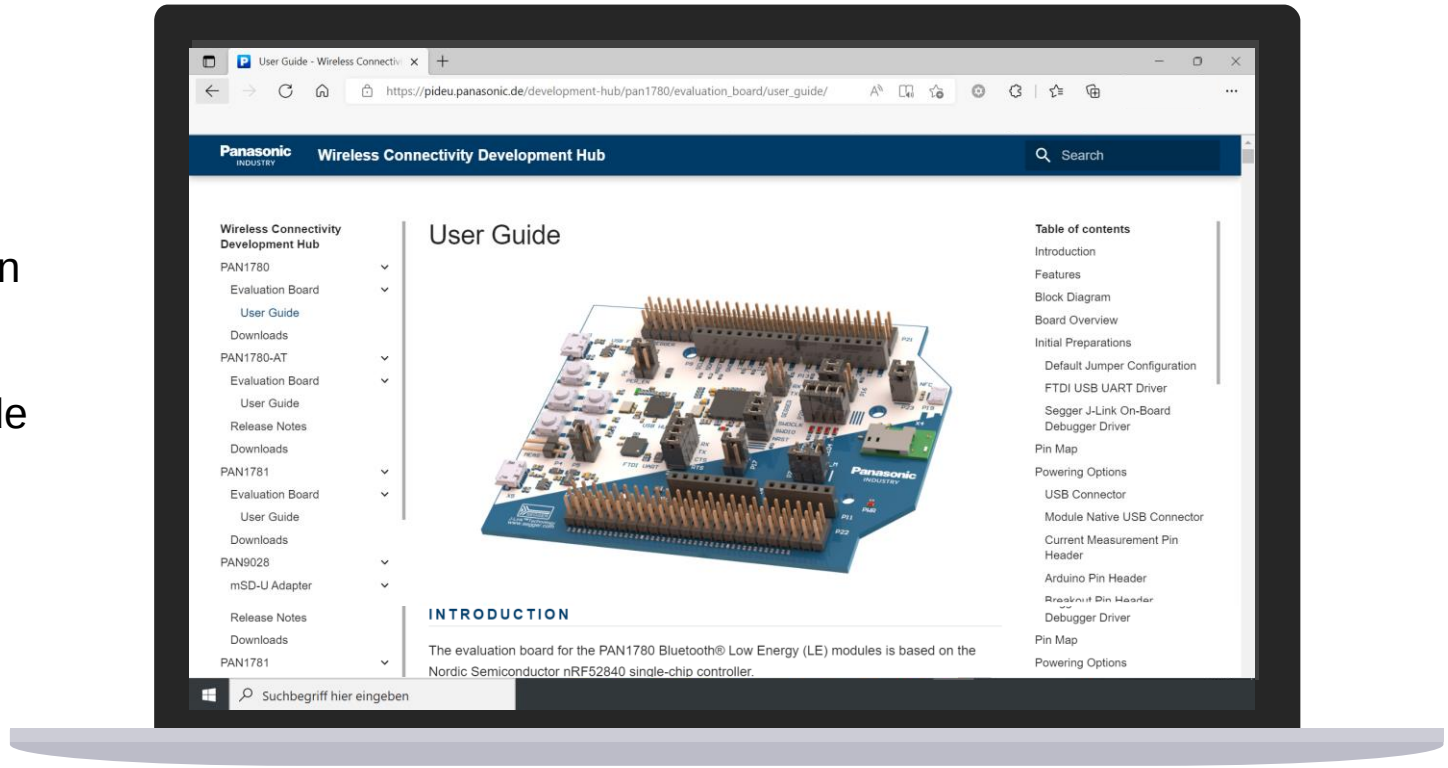
Publicly accessible documentation: Wireless Connectivity Development Hub

PAN B511-1 preview documentation available in Q1 2025

Get all the technical information on evaluation and development here:

- User Manuals for PAN B511-1 EVB
- Downloadable schematics of the Evaluation Board as reference design
- Getting started for Toolchain setup
- Samples and Demos quick start guide

Scan me!



https://pideu.panasonic.de/development-hub/

05

PAN MaX

SINGLE WINDOW MATTER ENABLEMENT

Introduction to matter

HOW to use Matter?

Connectivity Standards Alliance: Become a CSA member to get access to Matter technology

Wireless Modules: Use multi-protocol certified radio hardware to quickly enable Matter

Follow Matter Specification: Design for device models standardized in latest release

Device Security: Setup a CSA compliant PKI infrastructure for Matter in your production unit

Matter Certification Testing: Test your devices with a CSA authorized Test Service Provider

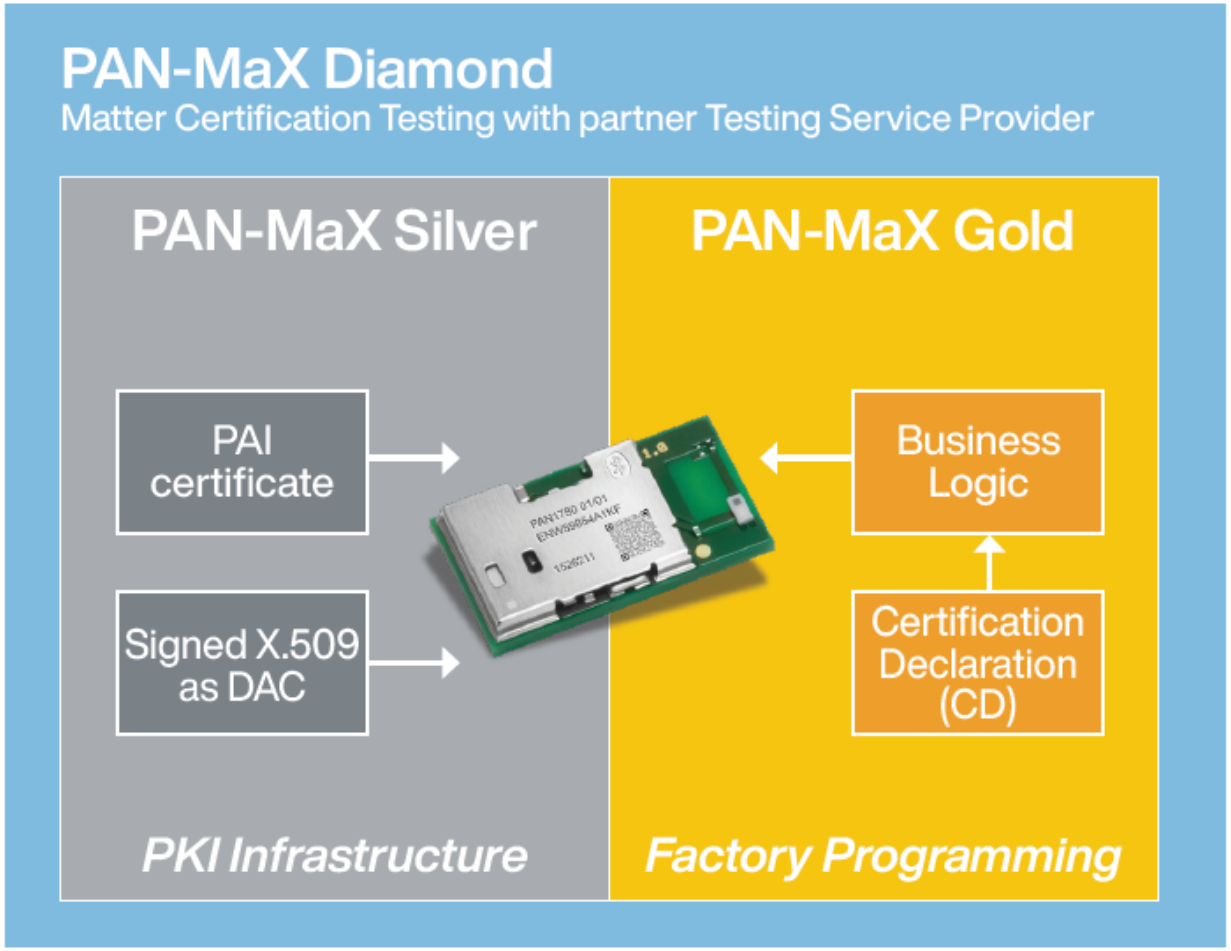
Non-Matter networks: Design “Bridge” device to bring non-native Matter devices onboard

Panasonic Industry strengths

PAN-MaX - a single window multi-tier service for matter

Supported On:

PAN-B511



PAN-MaX Diamond

Gold+ Panasonic driven Easy Access at a CSA Approved - Matter Testing Provider

PAN-MaX Gold

Silver + Customized Part number with Factory Software Programming Service for Business Logic (User App) and Certification Declaration

PAN-MaX Silver

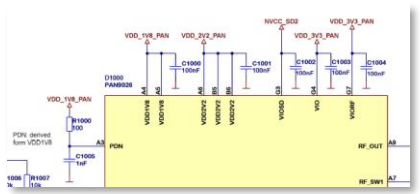
Public Key Infrastructure (PKI) with Panasonic as PAI
Signed X.509 Certificates for use as Matter DAC on Panasonic Modules

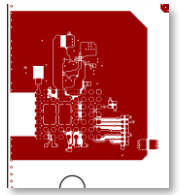
06

Additional Services

Additional Services

Hardware Design Review

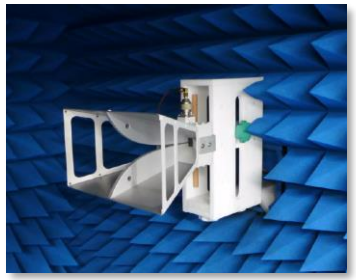


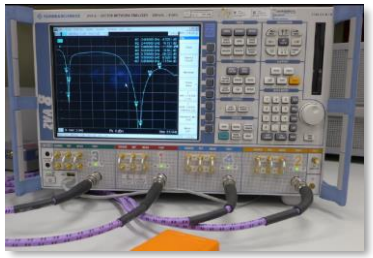


Any customer can have their design reviewed by Panasonic

- ➔ Schematic Review
- ➔ PCB Layout Review
- ➔ Duration: few days

Antenna integration validation / optimization





Customers can have their EVT samples' output power measured out by Panasonic

- ➔ Measurements:
  - Return Loss
  - Radiation Pattern
  - Peak Gain (to limited extent)
- ➔ Duration: 3 weeks

Conclusion

Start your Bluetooth 6 & Matter journey today with Panasonic modules!

Bluetooth 6

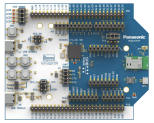
- Precise ranging
- Performance improvements and expanded feature sets

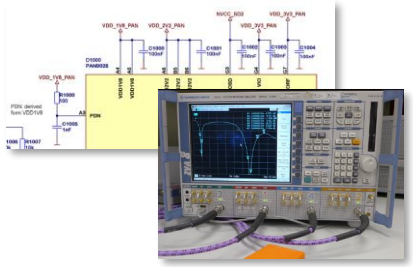
PAN-B511

State of the art Bluetooth Module

- Hybrid footprint design
- Small dimensions
- Extended certifications

Rapid Launch of Matter products





Easy development & strong support

Location

- ✓ Development & production in Europe
- ✓ Fast delivery time
- ✓ Support on short term

Quality Management

- ✓ Reliability & Assurance Center
- ✓ 100% end of line testing
- ✓ < 1 ppm failure rate

Strong European Supplier

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