PAN9028

Wi-Fi Dual Band 2.4 GHz/5 GHz and Bluetooth® Module

Module Integration Guide

Rev. 1.0

Overview

The PAN9028 is a 2.4 GHz/5 GHz ISM band Wi-Fi and Bluetooth radio module, which includes a wireless radio and a power management IC for easy integration of Wi-Fi and Bluetooth connectivity into various electronic devices.

Features

- Dual band 2.4 GHz/5 GHz 802.11 a/b/g/n/ac Wi-Fi and Bluetooth combo module
- The hardware is capable of WPA3 and supports 802.11i security standards through AES and CCMP
- 802.11e Quality of Service is supported for multimedia application
- IEEE 802.11ac (Wave 2), 1×1 spatial stream with data rates up to 433 Mbps (MCS9, 80 MHz channel bandwidth)
- IEEE 802.11ac MU-MIMO beamformee
- Bluetooth 5.2 (includes Low Energy)
- Dual simultaneous and independent WLAN and Bluetooth operation
- Dynamic Rapid Channel Switching (DRCS) for simultaneous operation in 2.4 GHz and 5 GHz bands
- Indoor location and navigation with IEEE 802.11mc

- Coexistence interface for arbitration of co-located WLAN, Bluetooth, or mobile wireless system (e.g. LTE or ZigBee®)
- Generic interfaces include SDIO 3.0 and high speed UART for host processor connection
- Software driver Linux®

Characteristics

- Surface Mount Type (SMT): 24 mm × 12 mm × 2.8 mm
- NXP® 88W8987 WLAN 2.4 GHz/5 GHz and Bluetooth single-chip solution inside
- Single power supply: 3.3 V with NXP PM823 Power Management IC (optional)
- Tx power: 16 dBm at 802.11b
- Rx sensitivity: -97 dBm at 802.11b DSSS 1 Mbps
- IEEE 802.11ac 20 MHz, 40 MHz, 80 MHz channel bandwidth
- Long and Short Guard Interval support
- Current consumption Wi-Fi typical 320 mA (at Tx) and 70 mA (at Rx)
- SDIO 1 bit or 4 bit
- Wide temperature range of -30 °C to 85 °C

Block Diagram
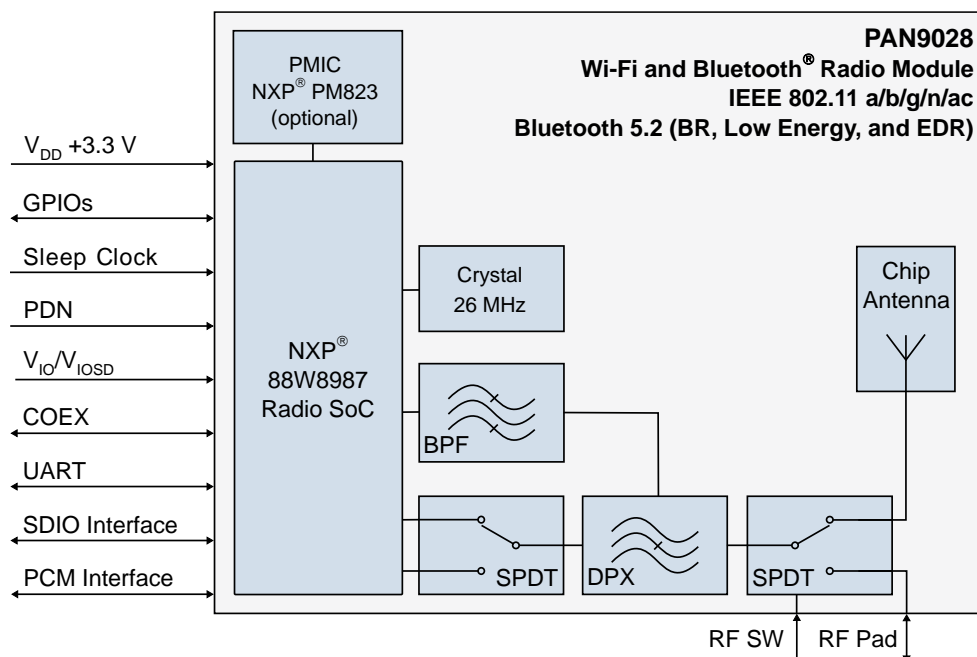
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Table of Contents

1 About This Document

1.1 Purpose and Audience

This Module Integration Guide is intended to support the easy integration of the PAN9028 into a product and to ensure the compliance with regulatory requirements.

This guide gives an overview about the hardware design requirements by providing a reference design, which is the evaluation board of the PAN9028.

It is intended for hardware design, application, and Original Equipment Manufacturers (OEM) engineers.

The product is referred to as "PAN9028" and "module" within this document.

1.2 Revision History

Revision	Date	Modifications/Remarks
1.0	2022-05-12	First 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 software.
⇨ [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** Indicates file names displayed on the screen or to be selected by the user. **Examples:** `pan1760.c` contains the actual module initialization.

`This font`	**Messages, user input, code**
	
	 Indicates messages, information, and code displayed on the screen or to be entered by the user.
	
	 Examples:
	
	 The message `Failed to save your data` is displayed.
	
	 Enter the value `Product 123`.
	
	 Copy firmware binaries to firmware library:
	
	 `$> cd ${TOP}/…`
	 `$> …`

Key	**Key** Indicates a key on the keyboard. **Example:** Press F10 .

1.4   Related Documents

For related documents please refer to the Panasonic website ⇨ 9.2 Product Information.

2 Overview

The PAN9028 is a dual band 2.4 GHz and 5 GHz 802.11 a/b/g/n/ac Wi-Fi radio module with integrated Bluetooth BR/EDR/Low Energy (LE), specifically designed for highly integrated and cost-effective applications. The simultaneous and independent operation of the two standards enables very high data rates (802.11ac) and low-power operation (Bluetooth LE). Integrated power management, a fast dual-core CPU, 802.11i security standard support, and high-speed data interfaces deliver the performance for the speed, reliability, and quality requirements of next generation products. Tx power calibration data, Wi-Fi, and Bluetooth system parameters are pre-stored on the One Time Programmable memory of the PAN9028 during production at Panasonic. This simplifies passing the certification process for PAN9028 customers. Furthermore, the module reduces design, test, and calibration effort resulting in reduced time-to-market compared to discrete solutions.

Integrating Wi-Fi and Bluetooth wireless connectivity allows high throughput applications for industrial devices and appliances. The combination of Wi-Fi and Bluetooth provides the highest flexibility for connectivity.

This Module Integration Guide applies to the PAN9028 WLAN/Bluetooth combo module and the PAN9028 mSDIO Adapter development platform.
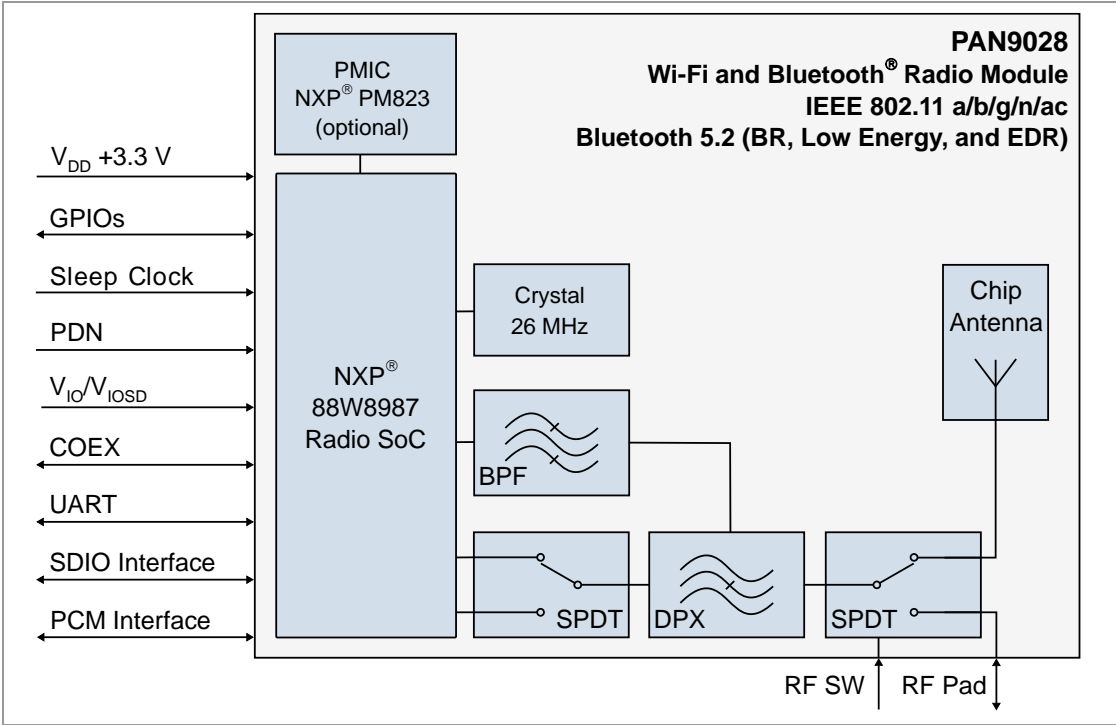
This document is structured into two main parts:

- The hardware integration of the PAN9028 module.
- The PAN9028 mSDIO Adapter as an example for the module integration.

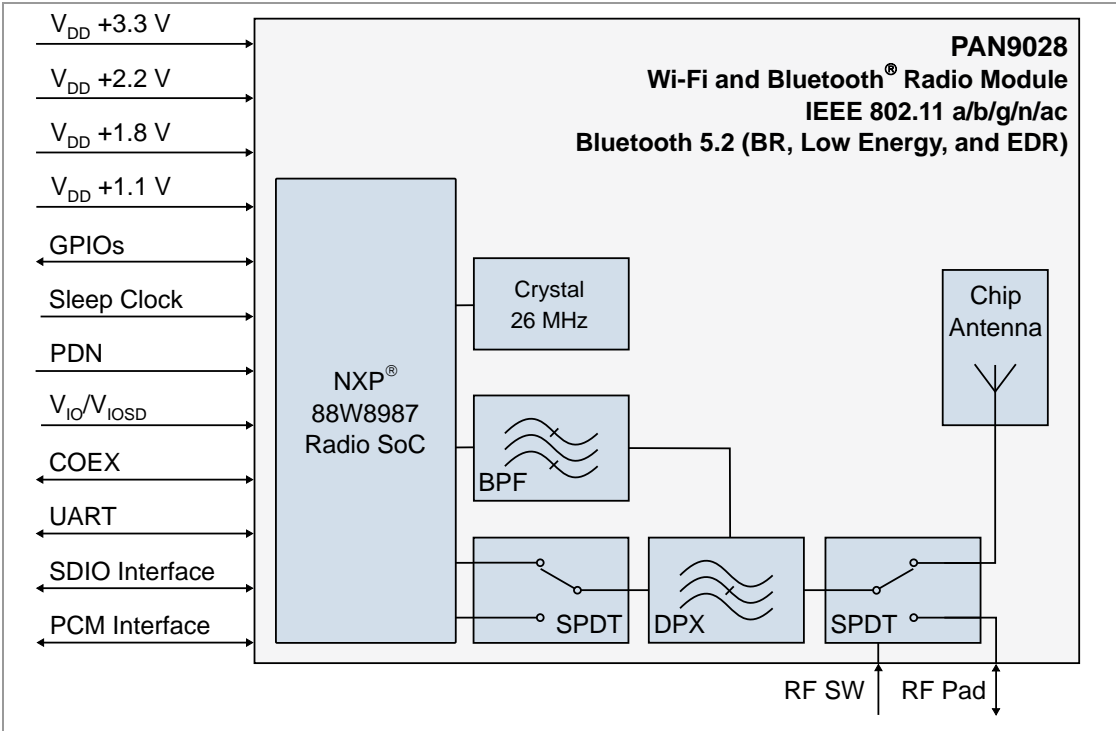For related documents please refer to ⇨ 9.2 Product Information.

3   PAN9028 Module

3.1   Block Diagram

For Module Variant ENWF940[x]A1EF:

For Module Variant ENWF940[x]A2EF:

3.2   Land Pattern

For Module Variant ENWF940[x]A1EF:

Top View

	1	2	3	4	5	6	7	8	9	10	11	12	
G	VOUT 2.2V	VOUT 2.2V	VIO	VOUT 1.8V	SD_CLK	SD_CMD	SD_DAT0	SD_DAT1	SD_DAT2	SD_DAT3	GND	RF	G
F	GND	VDD 3.3V	VDD 3.3V	VIO_SD	GPIO	GPIO	GPIO	GPIO	GPIO	GPIO	GND	GND	F
E	GPIO	EP 1		EP 2		SLEEP CLOCK IN	EP 1		EP 2		GND	GND	E
D	PG2	EP 1		EP 2		CONFIG HOST[0]	EP 1		EP 2		GND	GND	D
C	PGLDO	EP 1		EP 2		CONFIG AUTO REF DET					GND	GND	C
B	PG1	GPIO	DNC	GPIO	PDN	UART	UART	UART	GPIO	GPIO	RF_SW1	GND	B
A	GND	EN PMIC	VOUT 1.1 V	GPIO	DNC	UART	UART	UART	DNC	GPIO	RF_SW2	GND	A
	1	2	3	4	5	6	7	8	9	10	11	12	

For Module Variant ENWF940[x]A2EF:

Top View

	1	2	3	4	5	6	7	8	9	10	11	12	
G	VDD 2.2V	VDD 2.2V	VIO	VDD 1.8V	SD_CLK	SD_CMD	SD_DAT0	SD_DAT1	SD_DAT2	SD_DAT3	GND	RF	G
F	GND	VDD 3.3V	VDD 3.3V	VIO_SD	GPIO	GPIO	GPIO	GPIO	GPIO	GPIO	GND	GND	F
E	GPIO	EP 1		EP 2		SLEEP CLOCK IN	EP 1		EP 2		GND	GND	E
D	DNC	EP 1		EP 2		CONFIG HOST[0]	EP 1		EP 2		GND	GND	D
C	DNC	EP 1		EP 2		CONFIG AUTO REF DET					GND	GND	C
B	DNC	GPIO	DNC	GPIO	PDN	UART	UART	UART	GPIO	GPIO	RF_SW1	GND	B
A	GND	DNC	VDD 1.1 V	GPIO	DNC	UART	UART	UART	DNC	GPIO	RF_SW2	GND	A
	1	2	3	4	5	6	7	8	9	10	11	12	

3.3   Footprint

| (i)	The outer dimensions have a tolerance of ±0.35 mm.

Top View
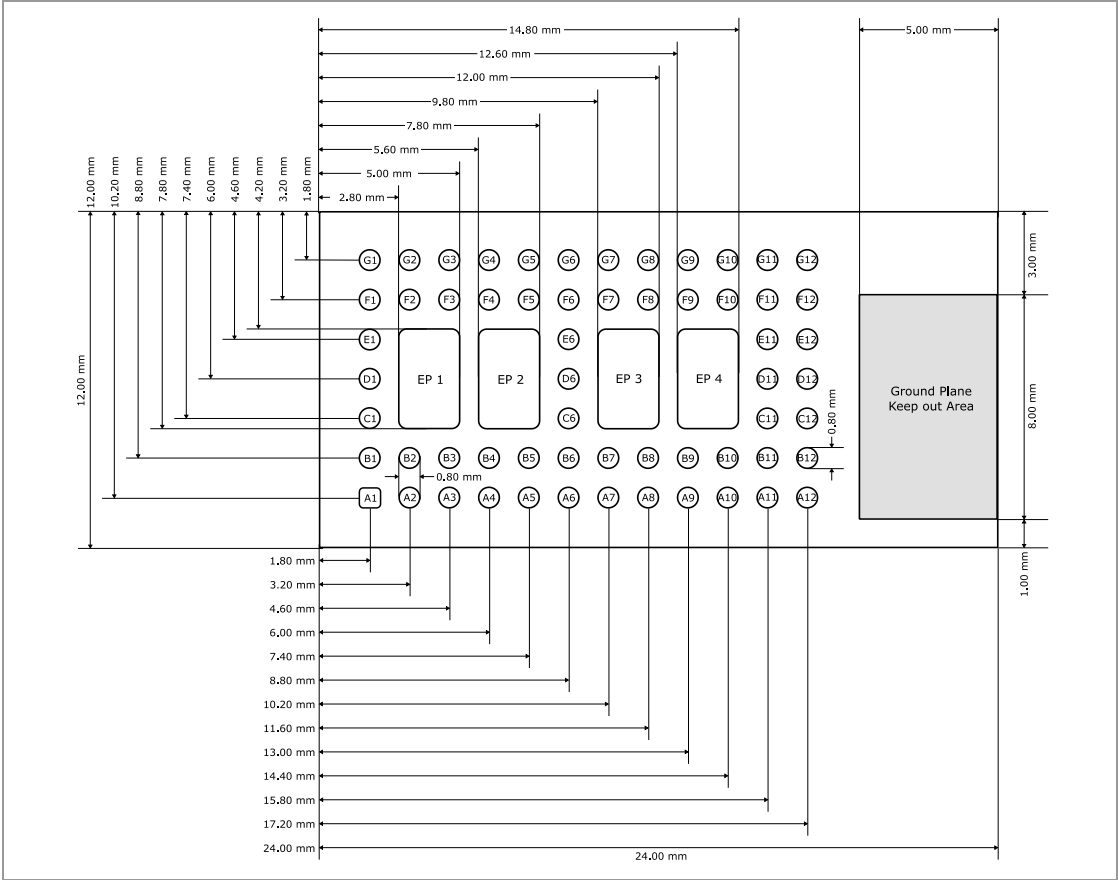
3.4   Solder Mask

It is recommended to use the following layout for the soldering mask to reduce voids on the thermal pads. Use the dimensions:

✓ The Resist Mask should be 50 µm bigger than the pad size (⇨ 3.3 Footprint).

✓ The Solder Mask should be 50 µm smaller than the pad size (⇨ 3.3 Footprint); they are separated in two semi circles with 300 µm distance and a shifting about 150 µm.

Layout
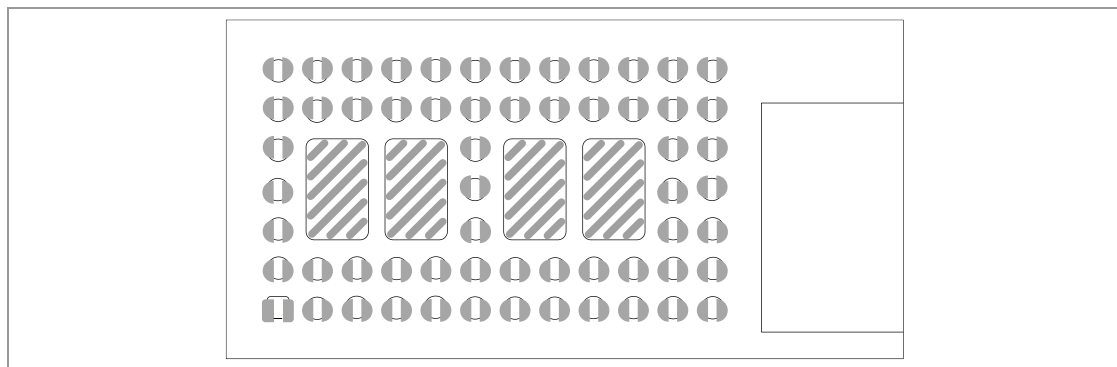
3.5   Placement

⚠	**Antenna "Keep out Area"** Do not place any ground plane under the marked restricted antenna area in any layer! This would be affecting the performance of the chip antenna in a critical manner.

⚠	**Impact of Placement on the Antenna Radiation Pattern** The placement of the module, surrounding material, and customer components has an impact on the radiation pattern of the antenna.

ⓘ	The recommendation for the ground plane is based on a FR4 4-Layer PCB.

The following requirements must be met:

✓ Keep this product away from heat. Heat is the major cause of decreasing the life of these products.

✓ Keep this product away from other high frequency circuits.

The antenna requires a cutout area of 8 mm × 5 mm under the PAN9028 module. This "Keep out Area" shall be located in every layer under the module antenna. Note for example the "Keep out Area" in all four layers of the PAN9028 evaluation board.

It is recommended to verify the perfect position of the module in the target application before fixing the design.

Antenna Placement Recommendation

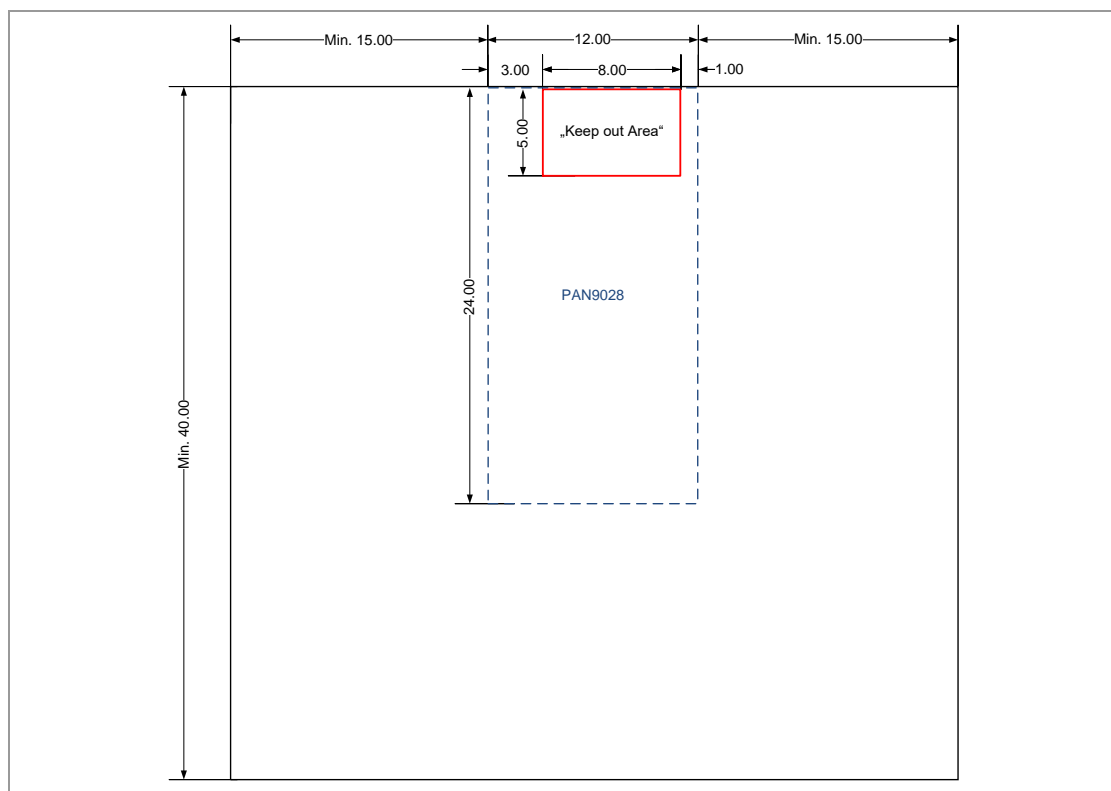> (i)   All dimensions are in millimeters.

> (i)   Use a ground plane in the area surrounding the module wherever possible.

It is recommended to place the module:
- In the center (horizontal) of mother PCB.
- At the edge (horizontal) of mother PCB.

Top View

4 Power Supply

## 4.1 General Guidances

The following conditions must be met:

✓ The supply voltage must be free of AC ripple voltage (for example from a battery or a low noise regulator output). For noisy supply voltages, provide a decoupling circuit (for example a ferrite in series connection and a bypass capacitor to ground of at least 47 µF directly at the module).

✓ The supply voltage must not be exceedingly high or reversed. It must not carry noise and/or spikes.
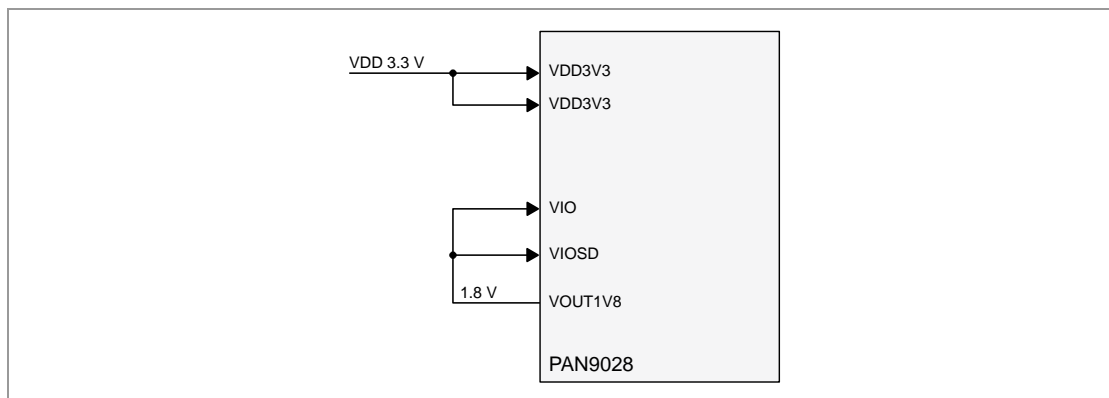
4.2 ENWF940[x]A1EF

⚠	ENWF940[x]A1EF: The power supply pins VOUT1V1, VOUT1V8, and VOUT2V2 are only for internal purpose. Do not use them to power external curcuits.

Power Configuration Example with 3.3 V Host Operation
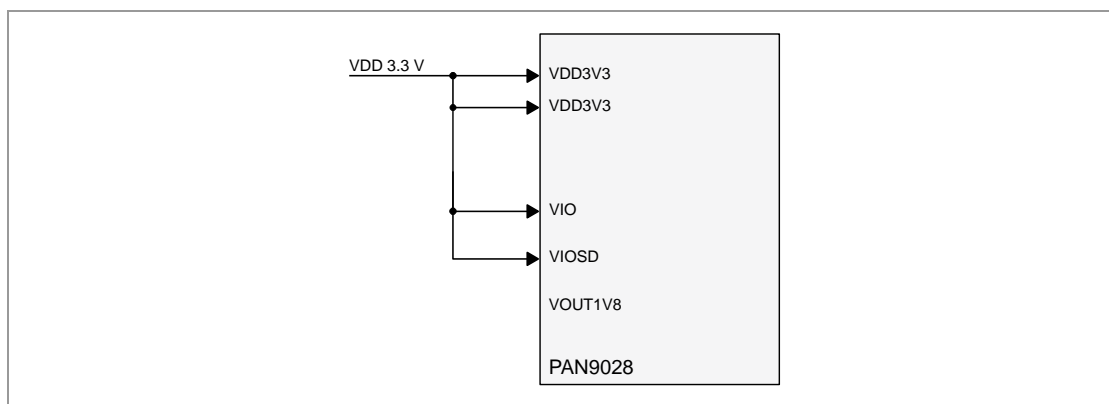
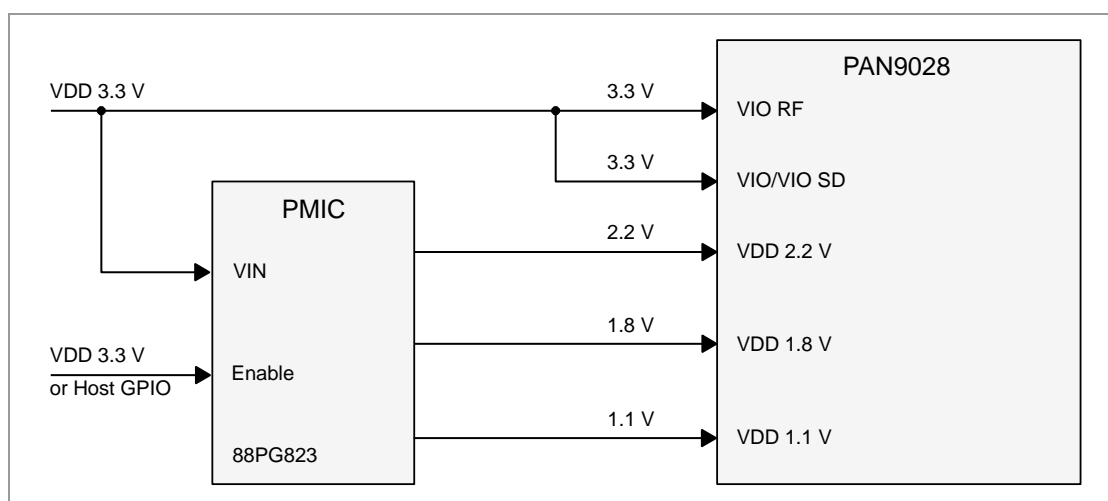**Power Configuration Example with 3.3 V Host Operation**

4.3   ENWF940[x]A2EF

⚠️ Follow the correct power-up sequence of module which is specified in "PAN9028 Product Specification" ⇨ 9.2 Product Information.

Power Configuration Example with 3.3 V Host Operation (PMIC)

⚠️ Using the PAN9028 with VIO = 3.3 V and VIO SD = 3.3 V voltage levels disable the high-speed interfaces, and only SDIO 2.0 and slow UART speed are available.

To enable high-speed interfaces SDIO 3.0 and High-speed UART, use VIO = 1.8 V and VIO SD = 1.8 V voltage levels.

Power Configuration Example with 3.3 V Host Operation (Discrete)

⚠️ Using the PAN9028 with VIO = 3.3 V and VIO SD = 3.3 V voltage levels disable the high-speed interfaces, and only SDIO 2.0 and slow UART speed are available.
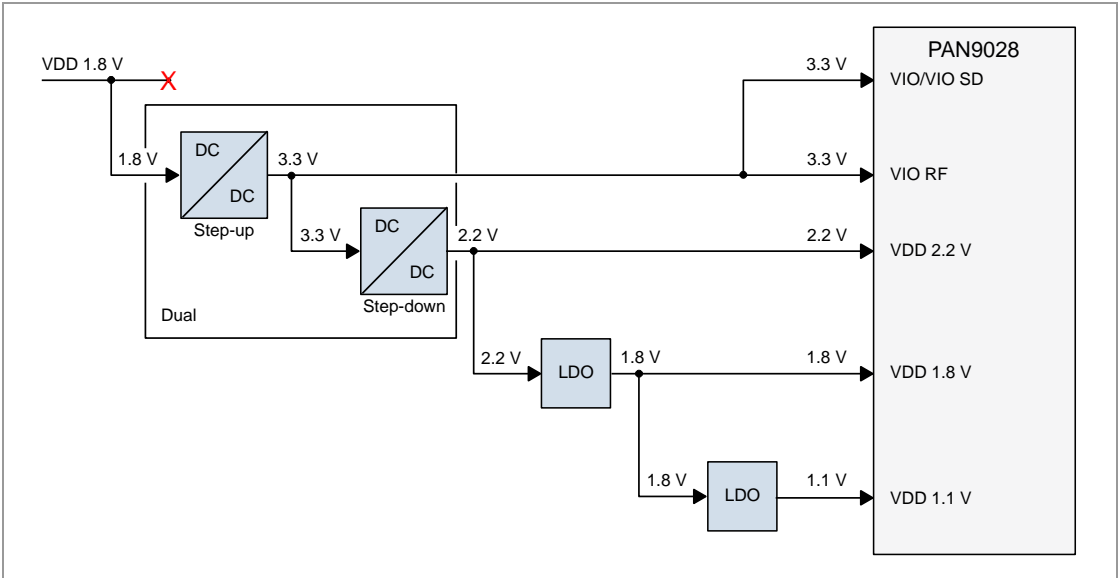
To enable high-speed interfaces SDIO 3.0 and High-speed UART, use VIO = 1.8 V and VIO SD = 1.8 V voltage levels.
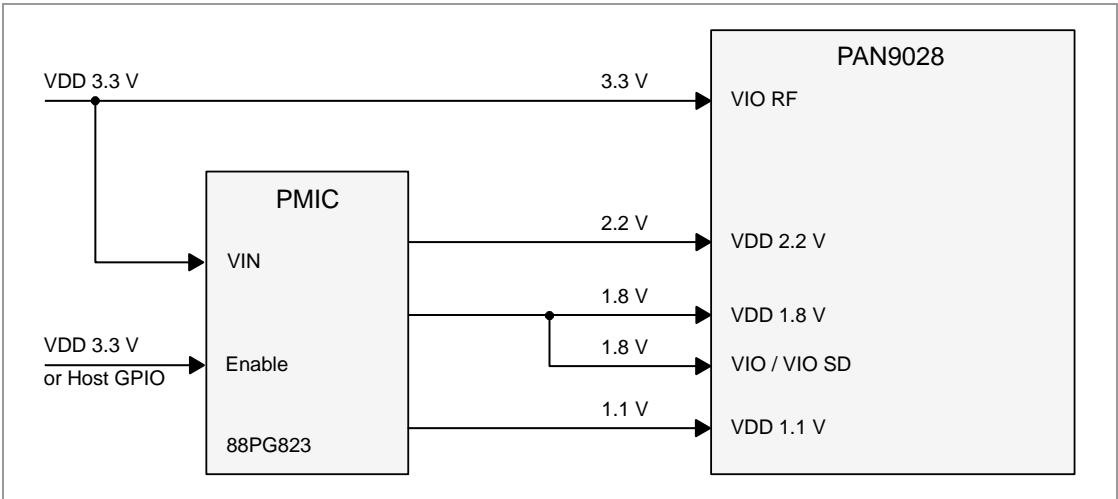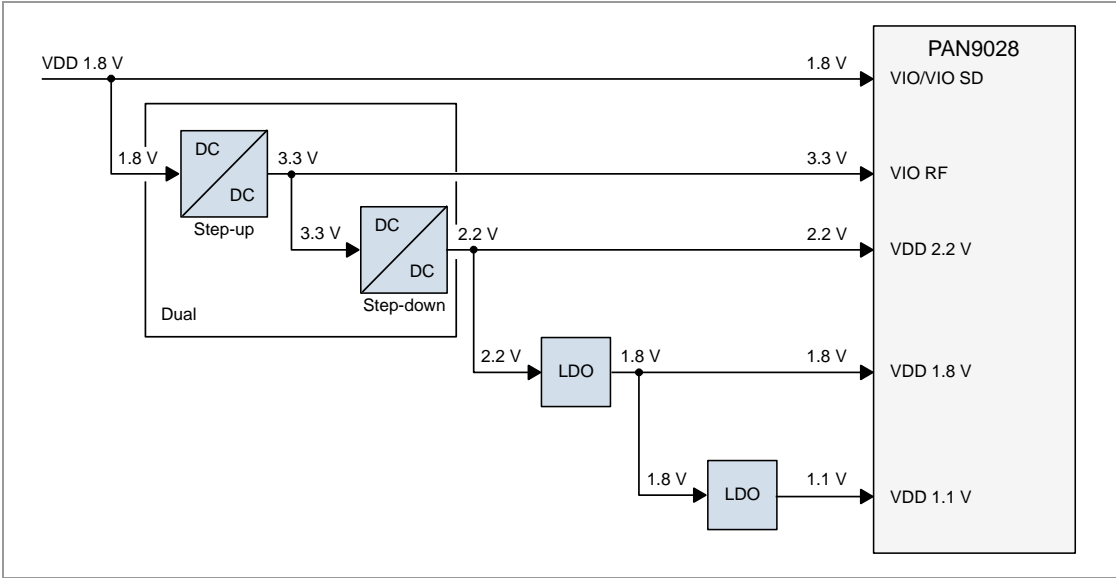

Power Configuration Example with 1.8 V Host Operation (PMIC)

Power Configuration Example with 1.8 V Host Operation (Discrete)

5 RF Path

5.1 External Antenna

> ⚠️ **Antenna Warning**
>
> The PAN9028 is tested with a standard U.FL connector and with the antenna listed in the "PAN9028 Product Specification". When integrated into the OEM's product, these fixed antennas require installation preventing end users from replacing them with non-approved antennas.
>
> Any antenna not listed in the "PAN9028 Product Specification" must be tested to comply with FCC Section 15.203 for unique antenna connectors and with Section 15.247 for emissions.

The PAN9028 module has a 50 ohm RF pin (SMD pad). Connect an external antenna directly or via a connector (e.g. U.FL) with RF trace to this RF pin. This RF trace shall be matched to 50 ohm ⇨ 5.2 RF Trace.

5.2 RF Trace

Ensure that the RF trace impedance is nearly 50 ohm. It is recommended to use a Coplanar Waveguide with Ground (CPWG) design. The impedance is related to the trace width, the distances of the trace to the ground layers and the material of the PCB.
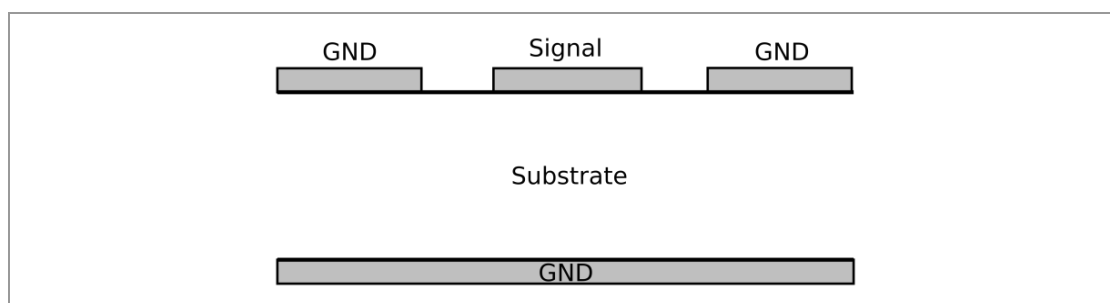
The following design recommendation shall be met:

- ✓ Trace impedance of 50 ohm
- ✓ Trace length shall not exceed 2 cm
- ✓ Via fence around the trace
- ✓ Crossing no other lines (power supply, interfaces, or clock traces)

Example 1: 50 ohm Coplanar Waveguide with Ground on mSDIO Adapter

Trace width	W = 180 µm
Trace distance to ground	S = 150 µm
Substrate thickness	H = 80 µm
Effective permittivity	ε_r = 3.9
Loss tangent	$\tan \delta$ = 0.015
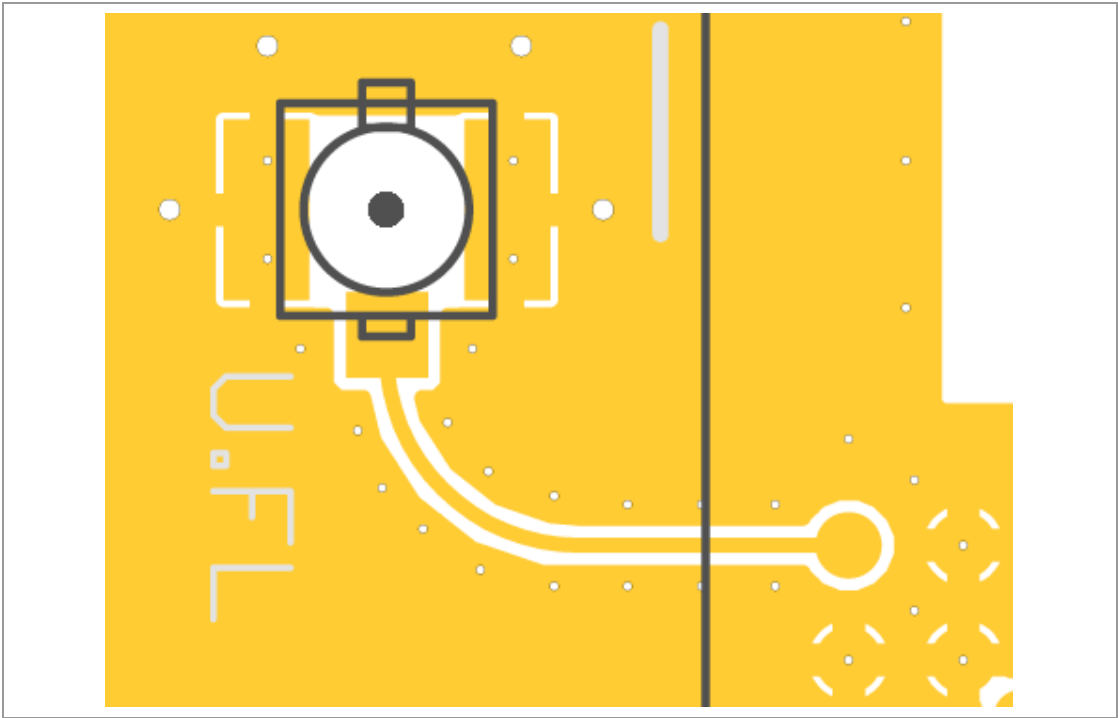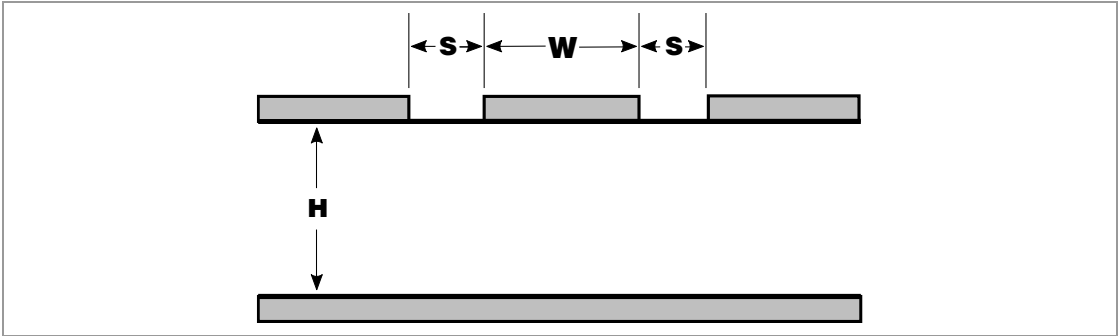
Example 2: 50 ohm Coplanar Waveguide with Ground and Micro Vias

Trace width	W = 300 µm
Trace distance to ground	S = 300 µm
Substrate thickness	H = 160 µm
Effective permittivity	ε_r = 4.2
Loss tangent	$\tan \delta$ = 0.006
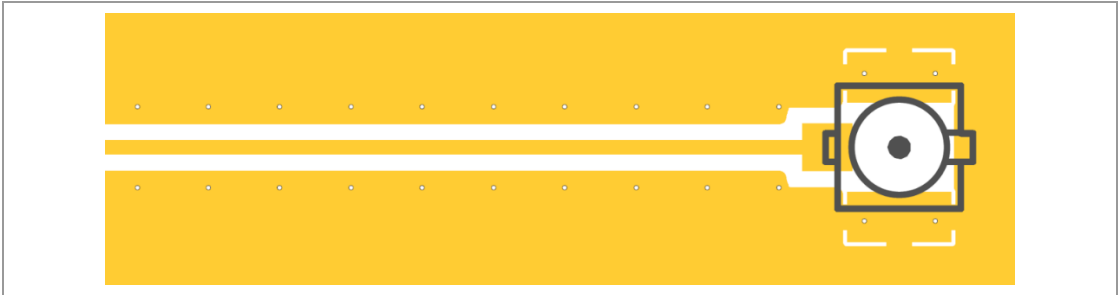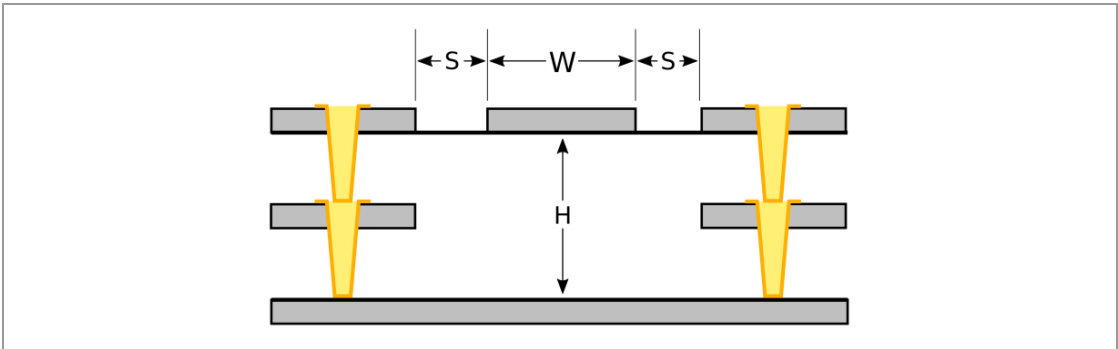
6 mSDIO Adapter

6.1 Functional Blocks
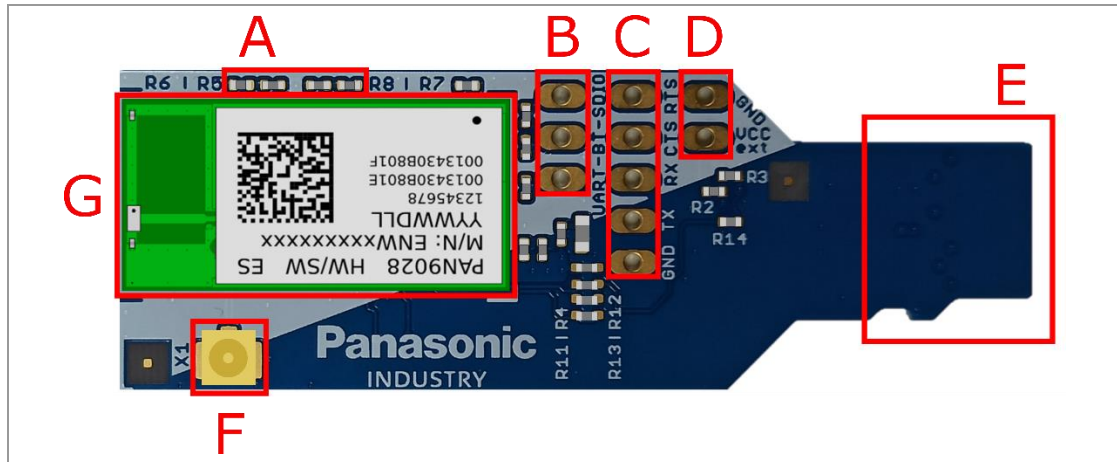
Functional Block	Description	Interface
A	On-board antenna or bottom pad selection	
B	Bluetooth data over UART or SDIO	
C	Bluetooth Interface	
D	External supply voltage can be connected	
E	SDIO interface	
F	U.FL connector	X1
G	PAN9028 module	

6.2 Resistor Jumper Configuration

R6	R7	RF-Out
0R	n.c.	PAN9028 chip antenna
n.c.	0R	RF-UFL X1 connector

6.3   Part Placement
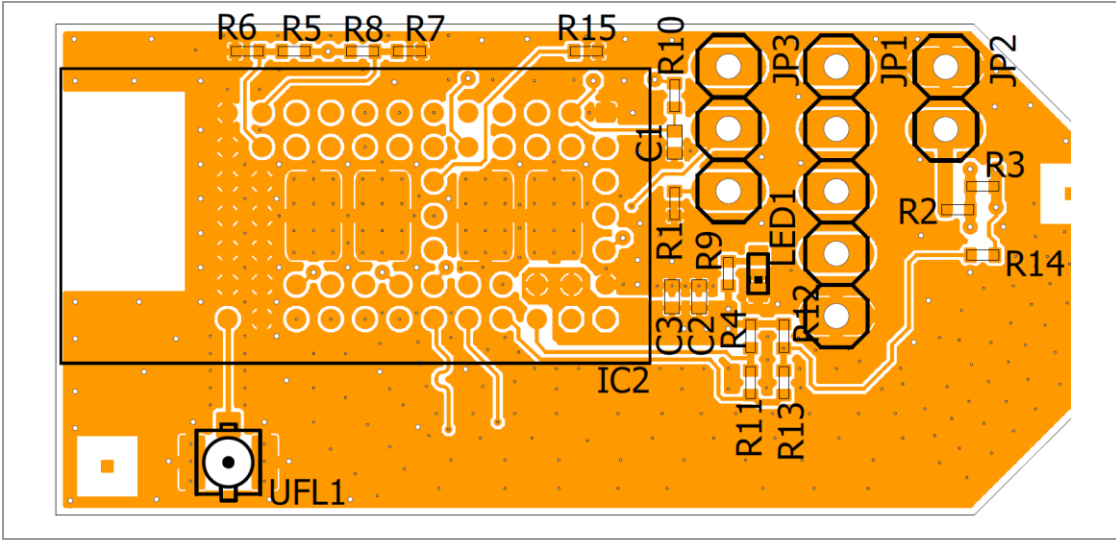
7   Reference Design

7.1   Schematic
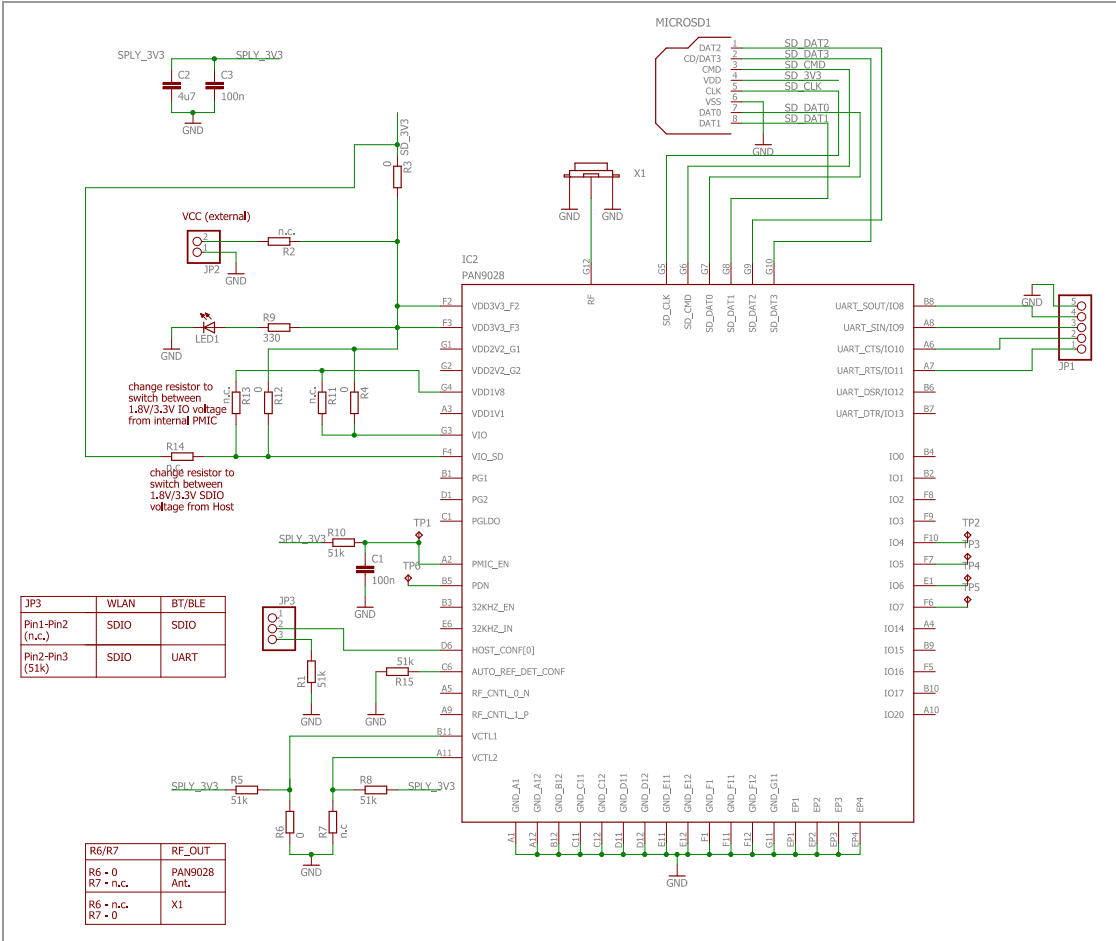
7.2   PCB Layout

⚠	Keep traces at configuration pins (e.g. VCTL1/2, HOST_CONF[0]) as short as possible. Place components if needed as close as possible to the PAN9028 module to ensure optimal regulatory compliance performance!

7.2.1 Top Layer
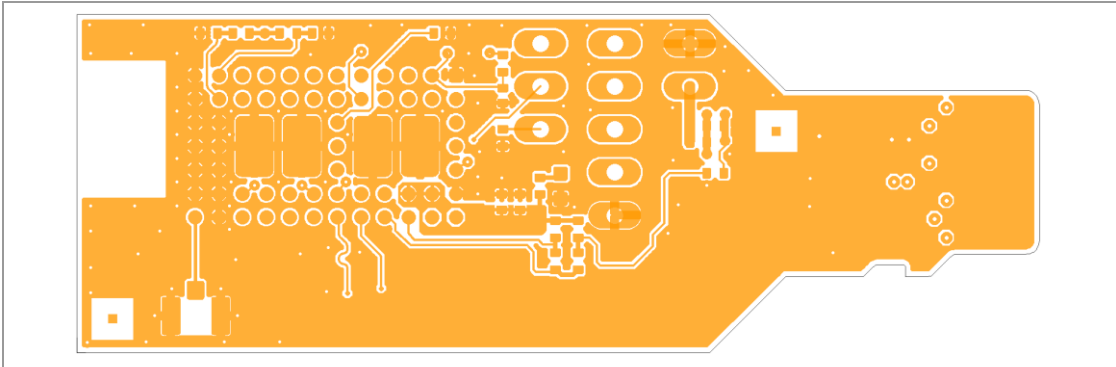
7.2.2 Second Layer
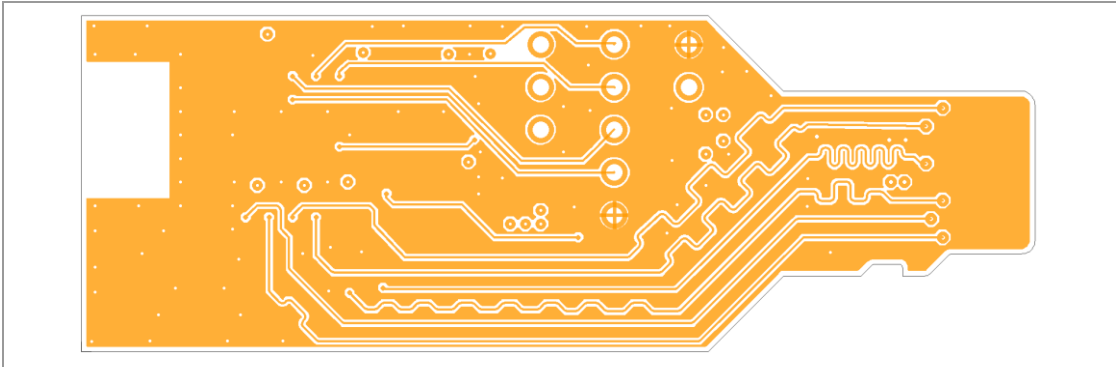
7.2.3 Third Layer (3.3 V Power Plane)
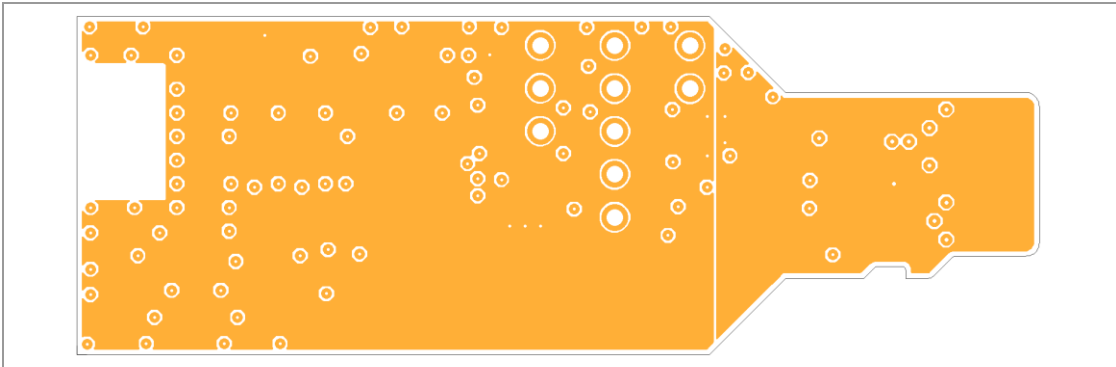
7.2.4 Bottom Layer
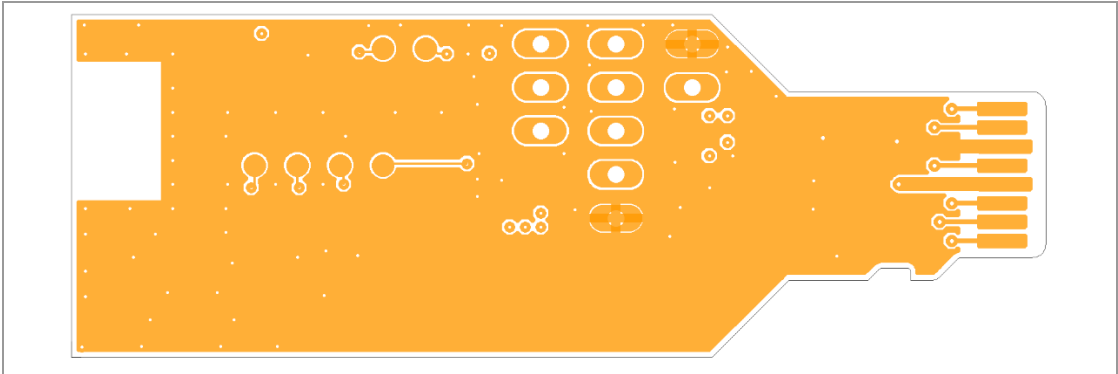
8 Regulatory and Certification Information

8.1 Federal Communications Commission (FCC) for US

8.1.1 FCC Statement

The following FCC statement has to be printed in the OEM end product user information:

> (i) The PAN9028, including the ceramic antenna (model ENWF9408A1EF and model ENWF9408A2EF) and the antennas, which are listed in ⇨ 8.1.5 Approved Antenna List, complies with Part 15 of the FCC Rules.

The device meets the requirements for modular transmitter approval as detailed in FCC public Notice DA00-1407. The transmitter operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

8.1.2 Caution

The following FCC caution has to be printed in the OEM end product user information:

> ⚠ The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by Panasonic Industrial Devices Europe GmbH may void the user's authority to operate the equipment.

> ⚠ This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules.
>
> These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

There is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception (which can be determined by turning the equipment off and on) the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna,
- Increase the separation between the equipment and receiver,
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected,
- Consult the dealer or an experienced radio/TV technician for help.

8.1.3   Label Requirements

The following labelling requirements have to be implemented on the OEM end product:

> The OEM must ensure that FCC labelling requirements are met. This includes a clearly visible label (laser marking) on the outside of the OEM enclosure specifying the appropriate Panasonic FCC identifier for this product as well as the FCC notice above.
>
> The FCC identifier is **FCC ID: T7V9028**.
>
> This FCC identifier is valid for the PAN9028.
> The end product must in any case be labelled on the exterior with:
>
> "Contains FCC ID: T7V9028".

Due to the PAN9028 model size, the FCC identifier is displayed in the installation instruction only and it cannot be displayed readable on the module's label due to the limited size.

8.1.4   Antenna Warning

The following antenna has to be followed by the OEM:

This antenna warning refers to the test device with the model number ENWF9408A1EF and ENWF9408A2EF in bottom pad mode (see "PAN9028 Product Specification" ⇨ 9.2 Product Information.)

The device is tested with a standard SMA connector and with the antenna listed below. When integrated into the OEM's product, these fixed antennas require installation preventing end users from replacing them with non-approved antennas. Any antenna not in the following table must be tested to comply with FCC Section 15.203 for unique antenna connectors and with Section 15.247 for emissions. The FCC identifier for the device with the antenna listed in ⇨ 8.1.5 Approved Antenna List is the same (**FCC ID: T7V9028**).

8.1.5 Approved Antenna List

Item	Part Number	Manufacturer	Type	Polarization	Frequency Band	Gain (dBi)
1	ANT162442DT-2001A2	TDK	Chip antenna	Linear	2.400 GHz to 2.484 GHz	2.1
					5.150 GHz to 5.850 GHz	1.5
2	X9001091-W3DRMW 2016693-x	Kyocera AVX TE Connectivity	Dipole antenna assembly	Linear	2.400 GHz to 2.485 GHz	1.8
					5.150 GHz to 5.850 GHz	2.9
3	X9001091-W3DRMB 2016693-x	Kyocera AVX TE Connectivity	Dipole antenna assembly	Linear	2.400 GHz to 2.485 GHz	1.8
					5.150 GHz to 5.850 GHz	2.9

8.1.6 RF Exposure

To comply with FCC RF Exposure requirements, the OEM must ensure that only antennas are installed which are listed in ⇨ 8.1.5 Approved Antenna List.

The preceding statement must be included as a "CAUTION" statement in manuals for products operating with the approved antennas to alert users on FCC RF Exposure compliance.

Any notification to the end user of installation or removal instructions about the integrated radio module is not allowed.

The radiated output power of the PAN9028 with a mounted ceramic antenna (**FCC ID: T7V9028** for model ENWF9408A1EF and model ENWF9408A2EF) are fulfilled for mobile configuration. The installation of the module is restricted to mobile host devices. The PAN9028 shall be used in such a manner that the potential for human contact during normal operation is minimized.

End users may not be provided with the module installation instructions. OEM integrators and end users must be provided with transmitter operating conditions for satisfying RF exposure compliance.

8.2   Innovation, Science, and Economic Development (ISED) for Canada

The following IC rules have to be followed by end product OEM's:

English

The PAN9028 and versions are licensed to meet the regulatory requirements of ISED.

License ID:	**IC: 216Q-9028**
HVIN:	**ENWF9408A1EF**
	ENWF9408A2EF

Manufacturers of mobile, fixed or portable devices incorporating this module are advised to clarify any regulatory questions and ensure compliance for SAR and/or RF exposure limits. Users can obtain Canadian information on RF exposure and compliance from www.ic.gc.ca.

This device has been designed to operate with the antennas listed in ⇨ 8.1.5 Approved Antenna List, having a maximum gain of 2.1 dBi (for 2.4 GHz) and 2.9 dBi (for 5 GHz). Antennas not included in this list or having a gain greater than 2.1 dBi (for 2.4 GHz) and 2.9 dBi (for 5 GHz) are strictly prohibited for use with this device. The required antenna impedance is 50 Ω. The antenna used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Due to the model size, the IC identifier is displayed in the installation instruction and on the package label only. It cannot be displayed readable on the module's label due to the limited size.

⚠️ The end customer has to assure that the device has a distance of more than 20 cm from the human body under all circumstances.

If the end customer application intends to use the PAN9028 in a distance smaller 20 cm from the human body, SAR evaluation has to be repeated by the OEM.

The end customer equipment must meet the actual Safety/Health requirements according to ISED.

French

PAN9028 (et ses versions) est garanti conforme aux dispositions règlementaires d'Industry Canada (ISED).

License: **IC: 216Q-9028**

HVIN: **ENWF9408A1EF**
                   ENWF9408A2EF

Il est recommandé aux fabricants d'appareils fixes, mobiles ou portables de consulter la réglementation en vigueur et de vérifier la conformité de leurs produits relativement aux limites d'exposition aux rayonnements radiofréquence ainsi qu'au débit d'absorption spécifique maximum autorisé.

Des informations pour les utilisateurs sur la réglementation Canadienne concernant l'exposition aux rayonnements RF sont disponibles sur le site www.ic.gc.ca.

Ce produit a été développé pour fonctionner spécifiquement avec les antennes listées dans le tableau ⇨ 8.1.5 Approved Antenna List, présentant un gain maximum de 2.1 dBi (pour 2.4 GHz) et 2.9 dBi (pour 5 GHz). Des antennes autres que celles listées ici, ou présentant un gain supérieur à 2.1 dBi (pour 2.4 GHz) et 2.9 dBi (pour 5 GHz) ne doivent en aucune circonstance être utilises en combinaison avec ce produit. L'impédance des antennes compatibles est 50 Ω.

L'antenne utilisée avec ce produit ne doit ni être située à proximité d'une autre antenne ou d'un autre émetteur, ni être utilisée conjointement avec une autre antenne ou un autre émetteur.

En raison de la taille du produit, l'identifiant IC est fourni dans le manuel d'installation.

> ⚠️ Le client final doit s'assurer que l'appareil se trouve en toutes circonstances à une distance de plus de 20 cm du corps humain.
>
> Si le client final envisage une application nécessitant d'utiliser le PAN9028 à une distance inférieure à 20 cm du corps humain, alors le FEO doit répéter l'évaluation DAS.
>
> L'équipement du client final doit répondre aux exigences actuelles de sécurité et de santé selon l'ISED.

8.2.1   IC Notice

The following IC notice has to be printed in English and French in the OEM end product user information:

English

> (i)   The device PAN9028 and versions, including the integrated antenna mentioned in ⇨ 8.1.5 Approved Antenna List, comply with Canada RSS-GEN Rules. The device meets the requirements for modular transmitter approval as detailed in RSS-Gen.

Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and

2. This device must accept any interference received, including interference that may cause undesired operation.

French

> (i)   Le présent appareil PAN9028, les antennes y compris ⇨ 8.1.5 Approved Antenna List est conforme aux CNR-Gen d'Industrie Canada applicables aux appareils radio exempts de licence.

L'exploitation est autorisée aux deux conditions suivantes:

1. L'appareil ne doit pas produire de brouillage, et

2. L'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

8.2.2   Labeling Requirements

The following IC labelling requirements have to be followed by end product OEM's:

English

> **Labeling Requirements**
>
> The OEM must ensure that IC labelling requirements are met. This includes a clearly visible label on the outside of the OEM enclosure specifying the appropriate Panasonic IC identifier for this product as well as the IC Notice above.
>
> The IC identifier is: **IC: 216Q-9028**.
>
> This IC identifier is valid for all PAN9028 modules ⇨ 9.2 Product Information. In any case, the end product must be labelled on the exterior with:
>
> "Contains IC: 216Q-9028".

French

> **Obligations d'étiquetage**
>
> Les fabricants d'équipements d'origine (FEO) – en anglais Original Equipment Manufacturer (OEM) – doivent s'assurer que les obligations d'étiquetage IC du produit final sont remplies. Ces obligations incluent une étiquette clairement visible à l'extérieur de l'emballage externe, comportant l'identifiant IC du module Panasonic inclus, ainsi que la notification ci-dessus.
>
> L' identifiant IC est: **IC: 216Q-9028**.
>
> Cet identifiant est valide pour tous les modules ⇨ 9.2 Product Information. Dans tous les cas les produits finaux doivent indiquer sur leur emballage externe la mention suivante:
>
> "Contient IC: 216Q-9028".

8.3   European Conformity According to RED (2014/53/EU)

> (i)   The PAN9028 modules with model number ENWF9408A1EF and ENWF9408A2EF comply with the standards according to the following LVD (2014/35/EU), EMC-D (2014/30/EU) together with RED (2014/53/EU) articles.

Standards

- Due to the model size, the CE marking is displayed in the installation instruction and on the package label only. It cannot be displayed according to regulation (EU) No. 765/2008 in 5 mm height on the module's label due to the limited space.
- The RED EU Type Examination Certificate No. **G0M-2010-9377-V01** issued by the Notified Body 0682, can be used for the OEM end product conformance assessment. If a Notified Body has been contracted for the end product conformity assessment, it should be noted that this EU Type Examination Certificate should be used for conformance assessment.

As a result of the OEM end product conformity assessment procedure described in 2014/53/EU Directive and other applicable EU directives, the end customer equipment should be labelled as follows:

$$C\,E$$

The requirements for CE marking are described in regulation (EU) No 765/2008 Annex II.

> ⚠   The end customer has to assure that the device has a distance of more than 20 cm from the human body under all circumstances.
>
> The end customer equipment must meet the actual Safety/Health requirements according to RED.

PAN9028 and its model versions in the specified reference design can be used in all countries of the European Economic Area (Member States of the EU, European Free Trade Association States [Iceland, Liechtenstein, Norway]), Monaco, San Marino, Andorra, and Turkey.

9   Contact Details

9.1   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

9.2   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