

ANR027

BLUETOOTH QUALIFICATION GUIDE

VERSION 1.5

JULY 12, 2024

WÜRTH ELEKTRONIK MORE THAN YOU EXPECT

Revision history

Manual version	Notes	Date
1.0	<ul style="list-style-type: none"> Initial version 	October 2021
1.1	<ul style="list-style-type: none"> Updated QDIDs for nRFConnect 	March 2022
1.2	<ul style="list-style-type: none"> Added chapter describing how to add a new product to an existing end product listing Applied style of the new corporate design to the document 	December 2022
1.3	<ul style="list-style-type: none"> Updated Important notes and meta data 	July 2023
1.4	<ul style="list-style-type: none"> Updated Important notes Added products Stephano-I, Orthosie-I and Ophelia-III Added Bluetooth® QDIDs for ESP-IDF Bluedroid, nRF Connect 2.3.0, 2.4.x and 2.5.x 	March 2024
1.5	<ul style="list-style-type: none"> Added the description of the new Bluetooth® Qualification process introduced by the Bluetooth® SIG in June 2024 corresponding to (QPRD) v3. 	July 2024

Abbreviations

Abbreviation	Name	Description
ATT	Attribute Protocol	Protocol of the Bluetooth® software stack to access the GATT layer
DID	Declaration ID	Identifier for the declaration (legacy listing process)
DN	Design number	Identifier for the Bluetooth® design, replacing the QDID
GAP	Generic Access Profile	Layer of the Bluetooth® software stack for connection oriented tasks
GATT	Generic Attribute Profile	Layer of the Bluetooth® software stack for Bluetooth® profile definition
HCI	Host Controller Interface	Standardized interface between controller and host subsystem
L2CAP	Logical Link Control Adaptation Protocol	Protocol of the Bluetooth® software stack for Bluetooth® link related tasks
LL	Link Layer	Layer of the Bluetooth® software stack for link related tasks
PHY	Physical Layer	Layer of the Bluetooth® software stack for physical data transmission
QDID	Qualified design ID	Identifier of the qualified Bluetooth® design (legacy listing process)
QPRD	Qualification Program Reference Document	Specification of the Bluetooth® qualification process
SM	Security Manager Protocol	Protocol of the Bluetooth® software stack to handle security related tasks
	Soft device	Bluetooth® stack used by the nRF52 chip series

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1 Introduction

This application note gives a short overview of the Bluetooth® organization and qualification process in chapter 1. In chapter 2 the main focus is put on how a qualification for the end device can be created when referring to Würth Elektronik eiSos Bluetooth® modules and their Bluetooth® qualification.



To bring an end device into the market, national radio certifications like FCC and CE must be gained besides of the Bluetooth® qualifications. How to get them will not be considered in this application note.

1.1 Bluetooth organization

The Bluetooth® SIG (special interest group) is the organization that controls the development of the Bluetooth® standard, and manages the use of the Bluetooth® technology, trademarks and licenses by manufacturers.

All manufacturers that use Bluetooth® technology and trademarks need to gain a so called "Bluetooth® qualification" for their products to bring them into the market. To be a member of the Bluetooth® SIG is a requirement for that. There are different types of memberships. The basic level, the so called "Adopter Membership", is free to join. More advanced memberships allow to contribute to future developments of the Bluetooth® standard, but are associated with membership fees.

1.2 Bluetooth specification

The Bluetooth® standard is defined in the Bluetooth® Core Specification document [1]. There are different versions of it, where each declares its mandatory and optional features. The Bluetooth® specification is always under development, such that new versions are released and old versions are withdrawn. Withdrawn specifications can no longer be used to gain a new Bluetooth® qualification, and thus new products using that can not enter the market.

1.3 Bluetooth qualification

To guarantee that each new device complies with the Bluetooth® specification, a so called Bluetooth® qualification must be gained. The qualification process has been updated at the July 1st 2024 by the Bluetooth® SIG.

1.3.1 Old process (Before July 2024)

The former process was called "listing process" and divided the required tasks into two main steps even requiring two IDs:

The **qualification** part, that basically proves that the new product complies with the Bluetooth® standard. This process ensures that the interoperability between all Bluetooth® devices is given. To gain the qualification various tests have to be performed. This includes the whole

range from physical radio tests to protocol and feature tests of the underlying Bluetooth® software stack. Each tested component of a qualification process gets a so called QDID (qualified design identifier) that certifies its conformance and can be reused, in case this component is used in another design.

For each product, in the **declaration** part the QDIDs of the used Bluetooth® components are collected and put together to the Bluetooth® listing of the product. To do so, a so called DID (declaration identifier) has to be purchased during the declaration process, that identifies the product. For adopter members the costs of this DID is 11040 \$ (June 2024) [2].

1.3.2 Current process

The new process is defined in the Qualification Program Reference Document v3 (QPRD). Here both parts have been summed up to simplify the whole process. It's simply called "qualification process", and the result is no longer a "Bluetooth® listing", it's a "Bluetooth® qualification".

Here a design number (DN) is identifying the design, which replaces the legacy QDID. To qualify a new device a new DN has to be created and an administrative fee has to be paid. For adopter members it's 11040 \$ (June 2024) [2].



Figure 1: Process overview. Source: bluetooth.com

This process will be described in chapter 2.

1.4 Product types

There are several types of qualifications, that contain different parts of the Bluetooth® standard:

Core complete: A product that contains the whole Bluetooth® functionality (from physical layer to Bluetooth® software stack layers) can be qualified as "Core complete" (formerly known as "end product"). As it contains all Bluetooth® functions, it can operate standalone.

Core controller: A product that contains only the layers related to the physical Bluetooth® link, equipped with a standardized host controller interface (HCI) can be qualified as "Core controller". For operation, it must be combined with the complementary part that is qualified as "Core host". This product type was formerly known as "Controller subsystem". Any USB Bluetooth® dongle with HCI is qualified as "Core controller". It runs only in combination with a personal computer hosting the Bluetooth® stack.

Core host: A product that contains only the Bluetooth® stack layers can be qualified as "Core host". For operation, it must be combined with the complementary part that is qualified as "Core Controller". This product type was formerly known as "Host subsystem".

Any operating system hosting a Bluetooth® stack is qualified as "Core host". It needs a Bluetooth® USB dongle, or any other Bluetooth® hardware with HCI qualified as "Core controller" to provide the Bluetooth® interface to the user.

X2 core layer: Any other product, that contains the qualification of one or several layers, that do not meet any other product type can be qualified as "X2 core layer", formerly known as "Tested component".

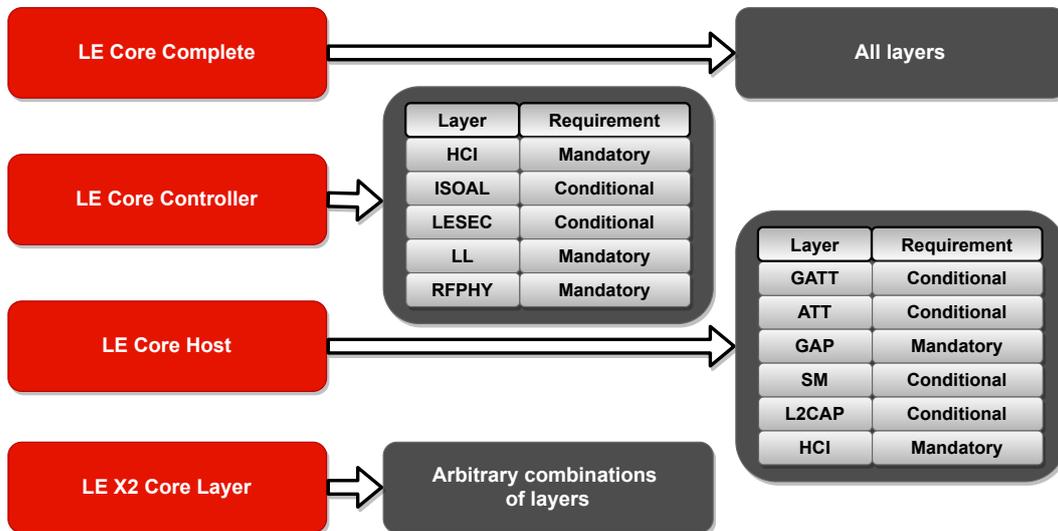


Figure 2: Product types

Products qualified as "Core complete", "Core controller" or "Core host" may enter the market. "X2 core layers" can only be used to create new "Core complete", "Core controller" or "Core host" qualifications.

2 Creating a new Bluetooth qualification for the end device

Würth Elektronik eiSos Bluetooth® radio modules, the underlying radio chips and the utilized Bluetooth® software stacks are fully qualified. Integrators of Würth Elektronik eiSos radio modules can refer to the existing DNs or QDIDs in the qualification process of their end device. Thus a new DN for the end device can be created without the need of running Bluetooth® conformity test, which saves time and money.

Finally there is the payment of an administrative fee¹, that has to be done once for the submission of the end device.

Once an qualification exists, new variants of the end device can be added free of charge, if it is using the same Würth Elektronik eiSos Bluetooth® radio module (refer to chapter 3).

The remaining chapter 2 describes how to do the qualification process for an end device using a Würth Elektronik eiSos radio module.

2.1 Get a Bluetooth membership

To perform a Bluetooth® qualification, you must be member of the Bluetooth® SIG. In case the registration has been already done before, jump to the next chapter. Otherwise follow the instructions under

<https://www.bluetooth.com/develop-with-bluetooth/join/>

and apply for an adopter membership, which is free of charge. This membership is sufficient to qualify a device.

2.2 Open the Bluetooth® Qualification Workspace

The qualification process of an end device must be done via the Bluetooth® Qualification Workspace website:

<https://qualification.bluetooth.com/>

To login into the Bluetooth® Qualification Workspace enter the membership account credentials that you received when registering to the Bluetooth® SIG.

¹In the former Bluetooth® declaration process, this was the cost for purchasing a declaration ID.

2.3 Search for the DN/QDID

As described above, all Bluetooth® components have already got a DN/QDID created by Würth Elektronik eiSos or the radio chip suppliers. In this chapter we collect all the necessary DNs/Q-DIDs such that the qualification process for the end device can be done in a row.

To run the search go to the "Product Search" tab in the Bluetooth® Qualification Workspace.

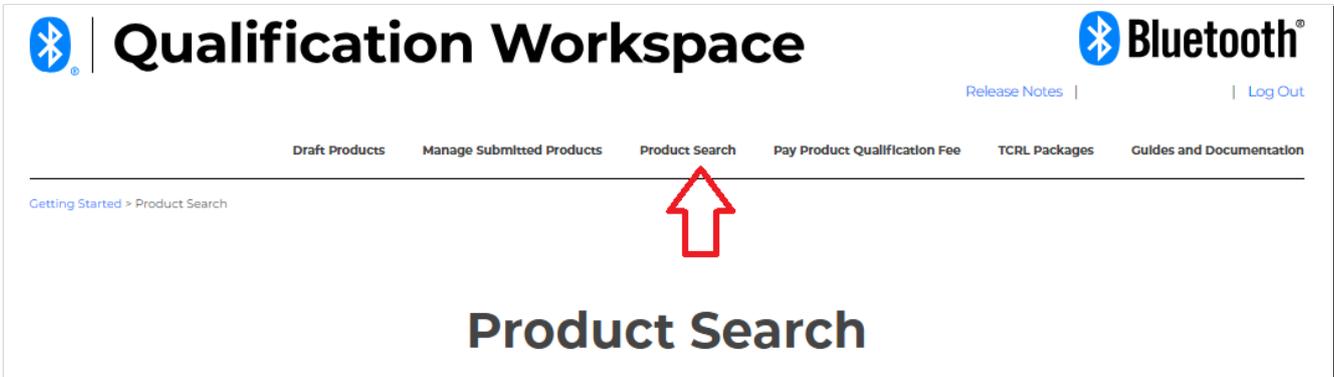


Figure 3: Open the search tab

2.3.1 DN/QDID of a radio module including firmware, like Proteus-III

 This chapter is only valid radio modules, where the firmware provided by Würth Elektronik eiSos is not been changed in the end device by the radio module integrator. Otherwise please refer to chapter 2.3.2.

Please enter the radio module name into the search field to find the DN/QDID of its "end product" qualification.

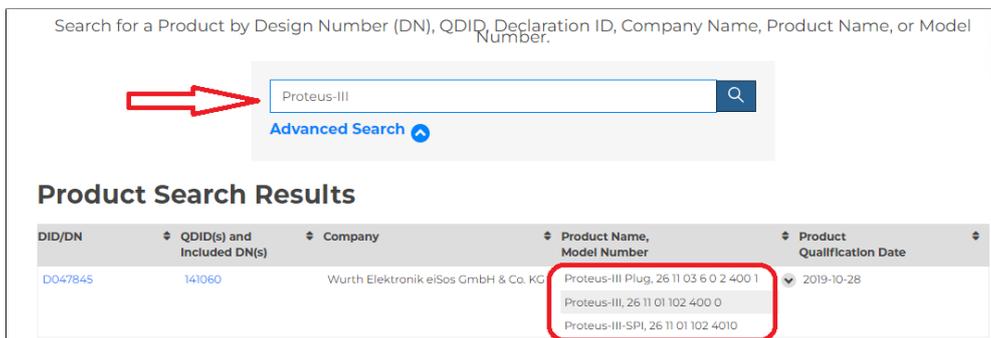


Figure 4: Search for the DN/QDID of Würth Elektronik eiSos radio modules with Würth Elektronik eiSos firmware

Article number	Module name	Type	DN/QDID
2608011024000, 2608011124000	Proteus-I (AMB2621)	End product	90212
2608011024010, 2608011124010	Proteus-II	End product	118943
2611011024000, 2611011024010	Proteus-III, Proteus-III-SPI	End product	141060
2612011024000	Proteus-e	End product	177585
2617011025000	Stephano-I hardware	Controller subsystem	227283
	Stephano-I Bluetooth® stack	Host subsystem	198312

Table 1: Radio module DNs/QDIDs

Only these DNs/QDIDs are needed, when integration a Würth Elektronik eiSos radio module is used, which includes firmware.

2.3.2 DN/QDID of a radio module custom firmware, like Ophelia-I



This chapter is only valid radio modules, where the radio module firmware has not been provided by Würth Elektronik eiSos.

In case the module integrator will flash a Bluetooth® software stack on the radio module, Würth Elektronik eiSos can not qualify the module as "end product", as it does not contain all Bluetooth® components at the time it has been sold.

To get the "end product / core complete" qualification of the end device, the DNs/QDIDs of the components of the radio chip and the chosen Bluetooth® software stack must be taken instead.

Here the goal is to combine the "controller subsystem / core controller" qualification of the radio chip and the "host subsystem / core host" qualification of the Bluetooth® software stack to one "Core-Complete" Qualified design.



Alternatively, the controller subsystem qualification of the radio chip can be replaced by its "tested component / X2core layer" qualifications of the PHY, and link layers (LL) and the HCI. Furthermore, the host subsystem qualification of the Bluetooth® software stack can be replaced by its "tested component / X2core layer" listings of the L2CAP, GAP, ATT, GATT and SM layers. In such a case, no retest is required. With the QPRD v3 the period of 3 years after which retesting was formerly required is abolished.

2.3.2.1 Search for the DN/QDID of the radio chip

To do so, click on "Advanced Search", enter "Controller Subsystem" and enter the provider of the radio chip. Take the newest entry that matches to the underlying radio chip.

Search for a Product by Design Number (DN), QDID, Declaration ID, Company Name, Product Name, or Model Number.

Advanced Search

Member Company
 My Company

Product Qualification Date
 From YYYY-MM-DD
 To YYYY-MM-DD

Specification Version

Layers
 3DSP
 80211 MAC-PHY
 80211PAL
 A2DP
 A2MP
 ACP
 ACS
 AICS
 AIOP
 AIOS

ICS Item

Product Search Results

DID/DN	QDID(s) and Included DN(s)	Company	Product Name, Model Number	Product Qualification Date
D066010	239299	Nordic Semiconductor ASA	SoftDevice Controller Subsystem for nRF52, Controller Subsystem for nRF52	2024-04-05
D066011	239342	Nordic Semiconductor ASA	SoftDevice Controller Subsystem for nRF53, Controller Subsystem for nRF53	2024-04-05

Figure 5: Search for the DN/QDID of the radio chip

Article number	Module name	Hardware (Radio chip/module)	Controller subsystem QDID
2608011024000, 2608011124000	Proteus-I (AMB2621)	Nordic Semiconductor nRF52832	214713
2608011024010, 2608011124010	Proteus-II	Nordic Semiconductor nRF52832	214713
2611011024000, 2611011024010, 2611011022000	Proteus-III, Proteus-III-SPI, Ophelia-III	Nordic Semiconductor nRF52840	214713
2612011024000, 2612011022000	Proteus-e, Ophelia-I	Nordic Semiconductor nRF52805	214713
2617011025000, 2617011022000	Stephano-I, Orthosie-I	Würth Elektronik eiSos	227283

Table 2: Bluetooth® radio chips

2.3.2.2 Search for the DN/QDID of the Bluetooth® software stack

Do the same for the Bluetooth® software stack by entering either "host subsystem" or "host layer tested component". Take the DN/QDID that matches the chosen Bluetooth® software stack.

Search for a Product by Design Number (DN), QDID, Declaration ID, Company Name, Product Name, or Model Number.

Advanced Search ▼

Member Company

My Company

Nordic Semiconductor ASA

Layers

- 3DSP
- 80211 MAC-PHY
- 80211PAL
- A2DP
- A2MP
- ACP
- ACS
- AICS
- AIOP
- AIOS

Product Qualification Date

From

To

Specification Version

ALL

ICS Item

3DSP 0/1

Product Search Results

DID/DN	QDID(s) and Included DN(s)	Company	Product Name, Model Number	Product Qualification Date
D068023	239354	Nordic Semiconductor ASA	nRF Connect SDK Host Subsystem, Host Subsystem for 2.6.x	2024-04-06
D064045	214837	Nordic Semiconductor ASA	nRF Connect SDK Host Subsystem, Host Subsystem for 2.4.x	2023-06-08

Figure 6: Search for the DN/QDID of the Bluetooth® software stack

Bluetooth® stack	Type	DN/QDID
nRFConnect SDK 2.6.x	Host subsystem	239354
nRFConnect SDK 2.5.x	Host subsystem	214837
nRFConnect SDK 2.4.x	Host subsystem	214837
nRFConnect SDK 2.3.0	Host subsystem	205603
nRFConnect SDK 2.2.0	Host subsystem	200785
nRFConnect SDK 2.1.0	Host subsystem	195971
nRFConnect SDK 2.0.0	Host subsystem	187856
S112, S113, S132, S140 V7.x.x Host layers	Tested component	136227
S112, S132, S140 V6.x.x Host layers	Tested component	122684
ESP-IDF Bluedroid Host (BT 5.3)	Host subsystem	198312
ESP-IDF Bluedroid Host (BT 5.2)	Host subsystem	164224

Table 3: Bluetooth® software stacks

Using the DNs/QDIDs of the radio chip and the Bluetooth® software stack, the declaration process can start.

2.4 Run the qualification process

To start the qualification process go to the tab "Getting started" under <https://qualification.bluetooth.com/> and click on "Start the Bluetooth Qualification Process".

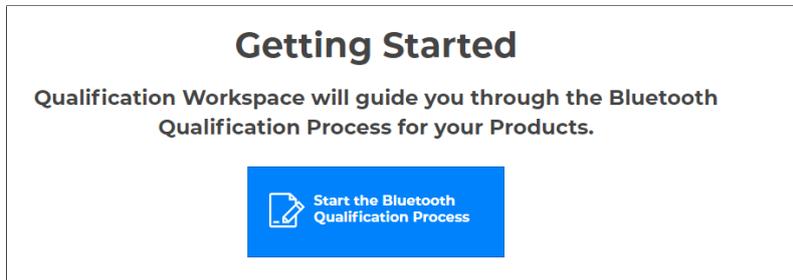


Figure 7: Start the qualification process

Then enter the details of the product that you want to qualify. As described before, several products can be collected under the same qualification, if all products are from the same manufacturer and have the same Bluetooth® components (hardware as well as software). In case several products shall be qualified at once, please add the details of all of them here.

Let's get started. Provide information about your Product(s).

You can return to this step any time prior to submission to update the Product name and model number to match those used by your company when marketing, advertising, distributing, and selling the Product.

Product Name

Product Description

Model Number

Product Publication Date

Certain Product information becomes visible to the public in the Qualified Product database at 00:00 UTC+00:00 Coordinated Universal Time (UTC) on the Product Publication Date you select. The Product Publication Date may not be later than 90 days after submission.

Product Website

Internal Visibility No (Product will NOT be visible to other users from your company prior to publication.) Yes (Product WILL be visible to other users from your company prior to publication.)

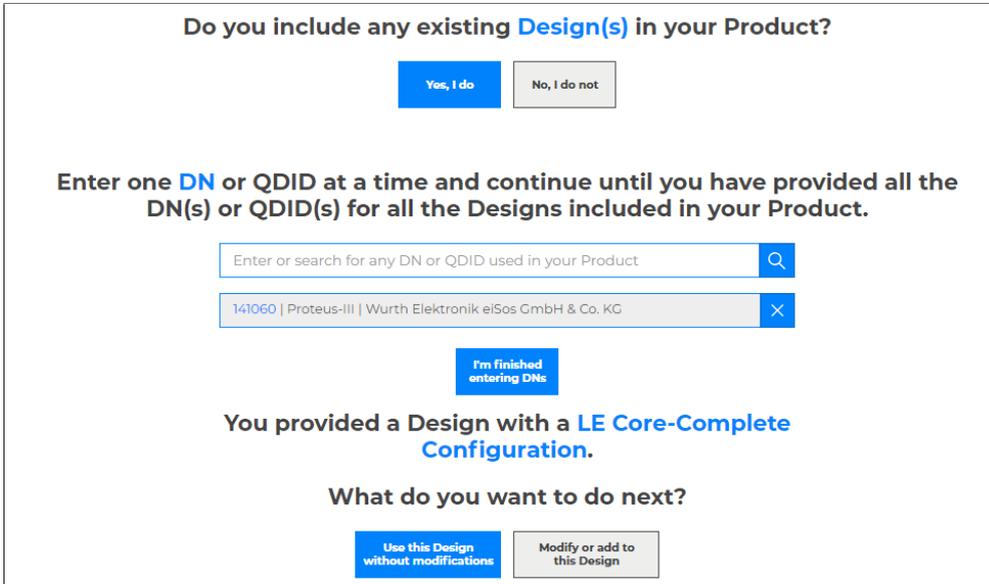
Product Name	Product Description	Model Number	Product Publication Date	Internal Visibility	Product Website
My new end device	This will change the world	2719272739131	2024-07-03	Yes	

Do you want to qualify any additional Product(s) that use the same Design?

Do you want to qualify Product(s) that use the same Design already included in an existing Qualified Product from your Member Company?

Figure 8: Add product details the qualification process

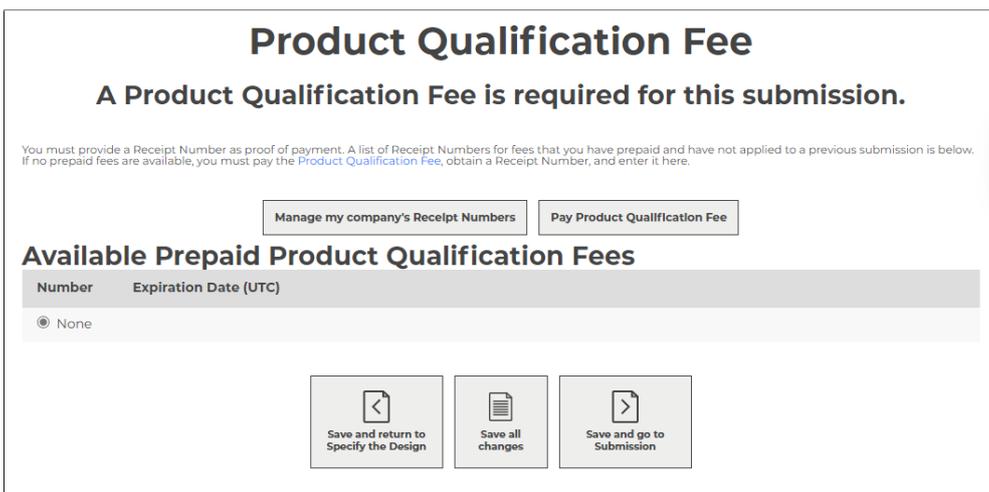
Next, enter the DNs/QDIDs of the Bluetooth® components to refer to. In case you are referring to a Würth Elektronik eiSos radio module with firmware, enter the QDID of the module’s end product qualification (see chapter 2.3.1). In case you are referring to a Würth Elektronik eiSos radio module without firmware, enter the QDIDs of the radio chip and the Bluetooth® software stack, subsequently (see chapter 2.3.2).



The screenshot shows a web interface for adding design identifiers. At the top, it asks "Do you include any existing Design(s) in your Product?" with two buttons: "Yes, I do" (highlighted in blue) and "No, I do not". Below this, instructions state: "Enter one DN or QDID at a time and continue until you have provided all the DN(s) or QDID(s) for all the Designs included in your Product." There is a search input field with the placeholder "Enter or search for any DN or QDID used in your Product" and a magnifying glass icon. Below the input field, a search result is displayed: "141060 | Proteus-III | Würth Elektronik eiSos GmbH & Co. KG" with a close button (X). A blue button labeled "I'm finished entering DNs" is positioned below the search results. The next section asks "What do you want to do next?" and provides two options: "Use this Design without modifications" (highlighted in blue) and "Modify or add to this Design".

Figure 9: Example design referring to Proteus-III radio module

If all QDIDs have been added, click on "Save and go to product qualification fee". In case you did not pay the product qualification fee so far, the list of available prepaid product qualification fees is empty. To pay the fee go to "Pay product qualification fee" and enter your details of payment.



The screenshot displays the "Product Qualification Fee" page. The main heading is "Product Qualification Fee" followed by the sub-heading "A Product Qualification Fee is required for this submission." Below this, a note states: "You must provide a Receipt Number as proof of payment. A list of Receipt Numbers for fees that you have prepaid and have not applied to a previous submission is below. If no prepaid fees are available, you must pay the Product Qualification Fee, obtain a Receipt Number, and enter it here." There are two buttons: "Manage my company's Receipt Numbers" and "Pay Product Qualification Fee". Below the buttons, the section "Available Prepaid Product Qualification Fees" contains a table with columns "Number" and "Expiration Date (UTC)". The table currently shows a single entry: "None" with a radio button selected. At the bottom of the page, there are three buttons: "Save and return to Specify the Design", "Save all changes", and "Save and go to Submission" (highlighted in blue).

Figure 10: Qualification fee

As soon as the payment has been received by the Bluetooth® SIG the receipt number of your payment shows up in the list of available prepaid product qualification fees. Select that and

"Save and go to submission".

On the last review page, all informations are summarized to review its correctness. In case it is correct, submit the product for qualification.

Once the submission is approved this will be shown in the Bluetooth® product database.

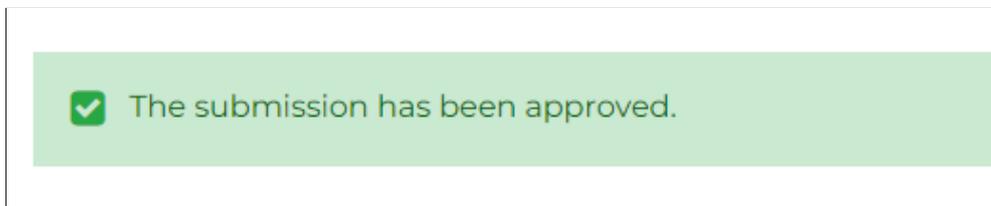


Figure 11: Submission approved

3 Qualify a new product of an already qualified product family

The Bluetooth® SIG allows to collect several products of a product family under a single qualification. Thus, when a product has been qualified, other variants of the product can be added, free of charge, if the following requirements² are fulfilled:

1. The new product and the already qualified product have the same manufacturer.
2. The new product and the already qualified product use the same Bluetooth® components. Bluetooth® components are all parts of Bluetooth® software and hardware, that are collected under the QDID/DN of the existing qualification.

In other words this means, that in case a Würth Elektronik eiSos radio module, like Proteus-III, is used in an end device, other end devices using the same module can be added free of charge.

With the new simplified qualification process, adding a product to an existing qualification is very similar to the steps described in chapter 2.

A qualification process must be started as shown in figure 7 and 8. Only on the question to qualify a product with an existing design of your member company, you must select "Yes, I do".

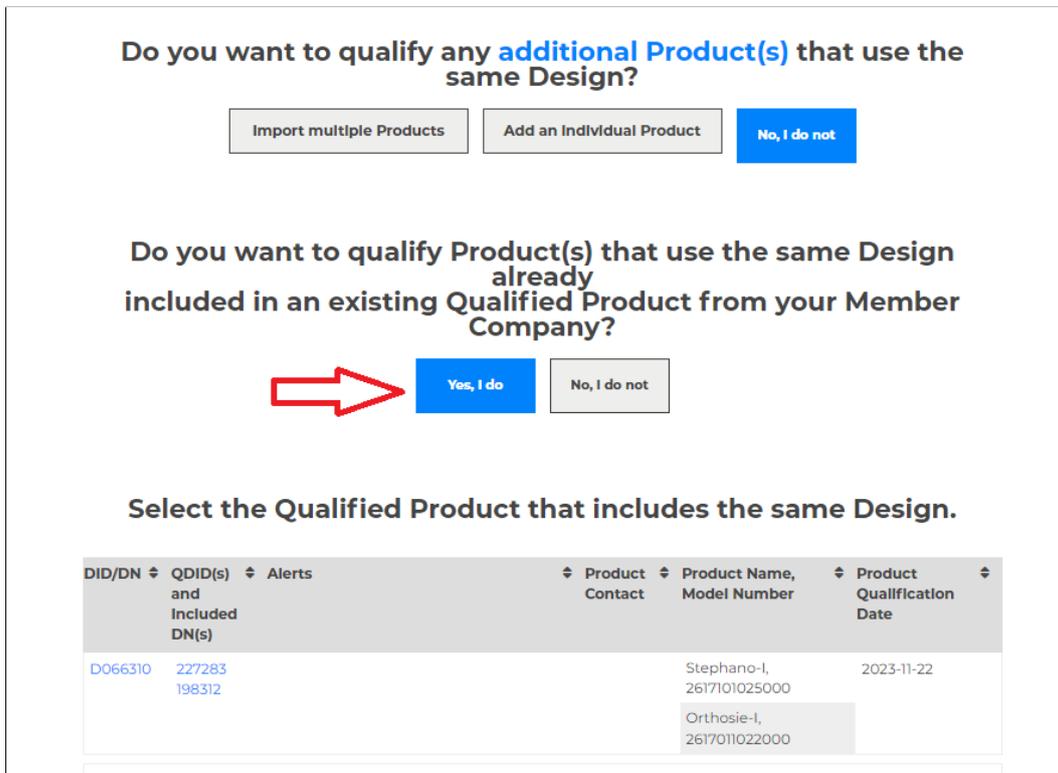


Figure 12: Add a product to an existing qualification

²Source: "Bluetooth® Qualification Program Reference Document (PRD)", Chapter: "Listing Requirements", Date: December 2022

Then, in the next step the design family has to be chosen, to which the product is added to. The phases of "design specification" and "payment of the fee" are saved, such that the next and final step is the product submission.

4 References

- [1] Bluetooth. Bluetooth Core Specifications. <https://www.bluetooth.com/specifications/bluetooth-core-specification/>.
- [2] Bluetooth. Bluetooth declaration fees. <https://www.bluetooth.com/develop-with-bluetooth/qualification-listing/qualification-listing-fees/>.

5 Important notes

The Application Note and its containing information ("Information") is based on Würth Elektronik eiSos GmbH & Co. KG and its subsidiaries and affiliates ("WE eiSos") knowledge and experience of typical requirements concerning these areas. It serves as general guidance and shall not be construed as a commitment for the suitability for customer applications by WE eiSos. While WE eiSos has used reasonable efforts to ensure the accuracy of the Information, WE eiSos does not guarantee that the Information is error-free, nor makes any other representation, warranty or guarantee that the Information is completely accurate or up-to-date. The Information is subject to change without notice. To the extent permitted by law, the Information shall not be reproduced or copied without WE eiSos' prior written permission. In any case, the Information, in full or in parts, may not be altered, falsified or distorted nor be used for any unauthorized purpose.

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The responsibility for the applicability and use of WE eiSos' components in a particular customer design is always solely within the authority of the customer. Due to this fact it is up to the customer to evaluate and investigate, where appropriate, and decide whether the device with the specific characteristics described in the specification is valid and suitable for the respective customer application or not. The technical specifications are stated in the current data sheet and user manual of the component. Therefore the customers shall use the data sheets and user manuals and are cautioned to verify that they are current. The data sheets and user manuals can be downloaded at www.we-online.com. Customers shall strictly observe any product-specific notes, cautions and warnings. WE eiSos reserves the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time without notice.

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If customer determines that the components are valid and suitable for a particular design and wants to order the corresponding components, customer acknowledges to minimize the risk of loss and harm to individuals and bears the risk for failure leading to personal injury or death due to customer's usage of the components. The components have been designed and developed for usage in general electronic equipment only. The components are not authorized for use in equipment where a higher safety standard and reliability standard is especially required or where a failure of the components is reasonably expected to cause severe personal injury or death, unless WE eiSos and customer have executed an agreement specifically governing such use. Moreover WE eiSos components are neither designed nor intended for use in areas such as military, aerospace, aviation, nuclear control, submarine, transportation, transportation signal, disaster prevention, medical, public information network etc. WE eiSos must be informed about the intent of such usage before the design-in stage. In addition, sufficient reliability evaluation checks for safety must be performed on every component which is used in electrical circuits that require high safety and reliability functions or performance. CUSTOMER SHALL INDEMNIFY WE EISOS AGAINST ANY DAMAGES ARISING OUT OF THE USE OF THE COMPONENTS IN SUCH SAFETY-CRITICAL APPLICATIONS.

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