

BLE microcomputer / module

Bluetooth qualification acquisition

Introduction

This document describes how to acquire Bluetooth qualification for a product with a Bluetooth® Low Energy (hereinafter BLE) technology compatible microcomputer (hereinafter BLE microcomputer) or a product with a module mounted with BLE microcomputer (hereinafter BLE module).

Target Device

- BLE microcomputer
 - RL78/G1D Group
 - RX23W Group
 - RA4W1 Group
- BLE module
 - RY7011

Note: This document is being made based on information on Dec 2018, and there will be a possibility that the contents change with a renewal in Bluetooth SIG website and change in the Bluetooth Qualification Program from now on.

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1. Overview

This application note describes how to register (Declaration) a product using a Qualified Design Identification number (QDID) of our qualified design when selling a device equipped with a BLE microcomputer or BLE module as a Bluetooth products.

Bluetooth SIG prescribes that it's necessary to satisfy the giving requirements of Bluetooth lisenze to sell a product using Bluetooth technology and a trademark. Please confirm the governance document with the following URL for details.

<https://www.bluetooth.com/about-us/governing-documents>

1.1 QDID of acquired qualified design

Figure 1-1 descriptions the composition of each product type of our qualified design.

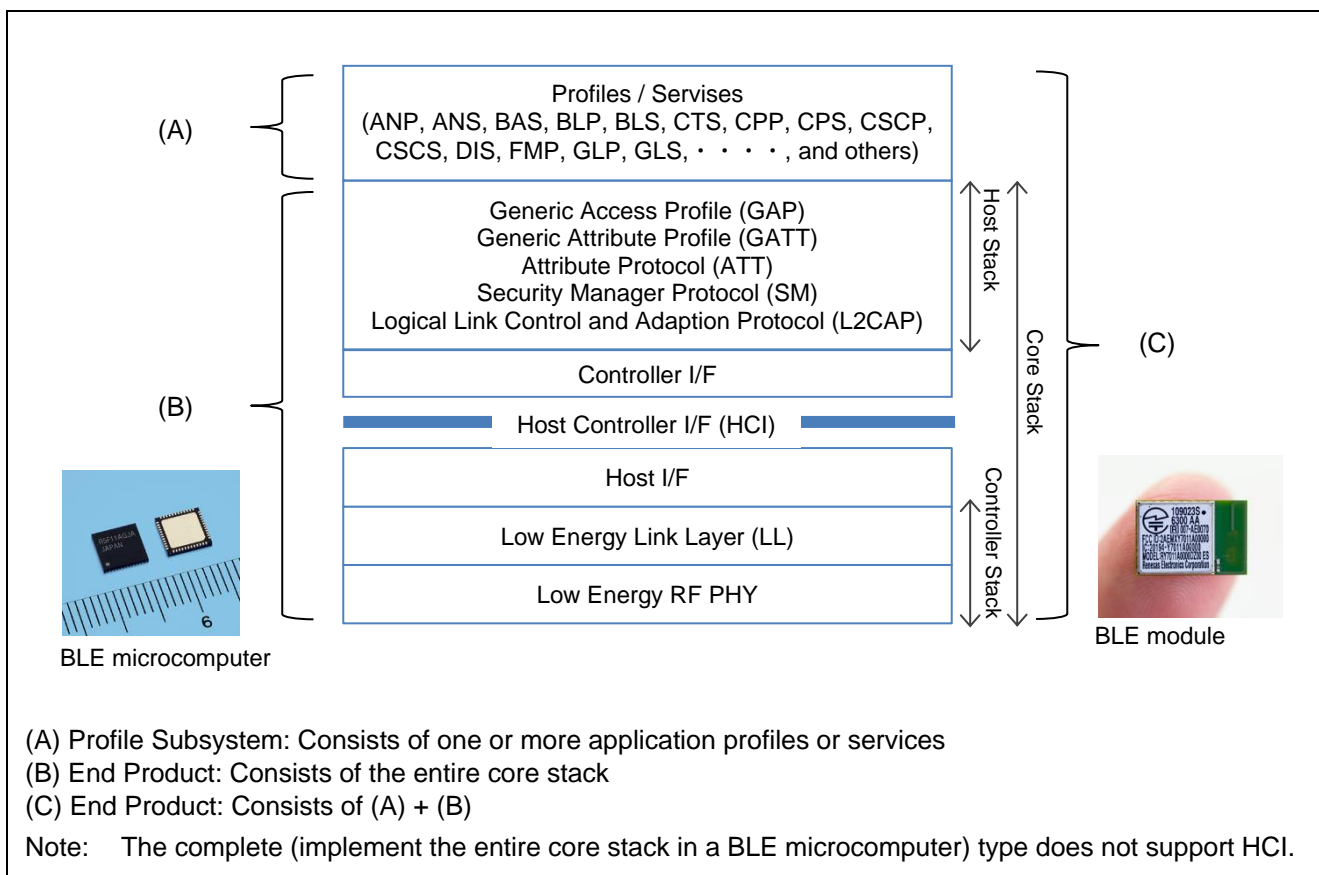


Figure 1-1 Product type composition

Table 1-1 descriptions the list of our acquired qualified design.

Table 1-1 Our acquired qualified design

BLE microcomputer / module	Qualified Design ID (QDID)	Declaration ID (DID)	Design Name	Product Type	Spec Name	Listing Date
RL78/G1D	78971	D029723	Renesas SMART Profiles	(A)	N/A	2016-01-19
	97611	D035743	Renesas SMART Profiles A-01	(A)	N/A	2017-06-16
	122047	D042604	R5F11Axxxxx - Core Stack (*1)	(B)	5.0 (*2)	2019-01-15
	78970 (*4)	D029722	Renesas SMART Core Stack (*1)	(B) (*3)	4.2 (*2)	2016-01-15
RY7011	82194	D030329	RL78/G1D Module (*5)	(C)	4.2 (*2)	2016-04-22
RX23W	134527	D044685	Mesh Qualification_rBLEx_Mesh1.01	(A)	N/A	2019-11-01
RX23W, RA4W1	134484	D044684	GATT Profile Qualification_rBLEx_GPS01	(A)	N/A	2019-11-01
	134349	D044683	LE Core Qualification_rBLE50A (*1)	(B)	5.0	2019-11-01

Notes: *1. Surface mounted component and the circuit pattern are included in the certification condition.

*2. Optional functions added to Core Specification 4.2 or later are not supported.

*3. Product type of acquired qualified design is "Component".

*4. Expires on 1/15/2019 (cannot be referenced when registering products).

*5. Combined design: 78970, 78971.

1.2 Support Profiles / Services

Table 1-2 descriptions the profiles and services supported by each Profile Subsystem (A).

Table 1-2 Support Profiles / Services

Profile / Service		RL78/G1D		RX23W, RA4W1	RX23W
		78971	97611	134484	134527
ANP	Alert Notification Profile	●		●	
ANS	Alert Notification Service	●		●	
Aiop	Automation IO Profile			●	
Aios	Automation IO Service			●	
BAS	Battery Service	●		●	
BCS	Body Composition Service			●	
BLP 1.0	Blood Pressure Profile 1.0	●			
BLP 1.0.1	Blood Pressure Profile 1.0.1			●	
BLS	Blood Pressure Service	●		●	
BMS	Bond Management Service			●	
BSP	Binary Sensor Profile				
BSS	Binary Sensor Service				
CGMP 1.0	Continuous Glucose Monitor Profile 1.0				

Profile / Service		RL78/G1D		RX23W, RA4W1	RX23W
		78971	97611	134484	134527
CGMP 1.0.1	Continuous Glucose Monitor Profile 1.0.1			●	
CGMS 1.0	Continuous Glucose Monitor Service 1.0				
CGMS 1.0.1	Continuous Glucose Monitor Service 1.0.1			●	
CPP 1.0	Cycling Power Profile 1.0	●			
CPP 1.1	Cycling Power Profile 1.1			●	
CPS 1.0	Cycling Power Service 1.0	●			
CPS 1.1	Cycling Power Service 1.1			●	
CSCP	Cycling Speed and Cadence Profile	●		●	
CSCS	Cycling Speed and Cadence Service	●		●	
CTS 1.0	Current Time Service	●			
CTS 1.1	Current Time Service			●	
DIS 1.1	Device Information Service	●		●	
EMP	Emergency Profile				
EMCS	Emergency Configuration Service				
ESP	Environmental Sensing Profile			●	
ESS	Environmental Sensing Service			●	
FMP	Find Me Profile	●		●	
FTMP	Fitness Machine Profile			●	
FTMS	Fitness Machine Service			●	
GLP	Glucose Profile	●		●	
GLS	Glucose Service	●		●	
HOGP	HID over GATT Profile	●		●	
HIDS	HID Service	●		●	
HPS	HTTP Proxy Service				
HRP	Heart Rate Profile	●		●	
HRS	Heart Rate Service	●		●	
HTP	Health Thermometer Profile	●		●	
HTS	Health Thermometer Service	●		●	
IAS	Immediate Alert Service	●		●	
IDS	Insulin Delivery Service			●	
IDP	Insulin Delivery Profile			●	
IPS	Indoor Positioning Service				
IPSP	Internet Protocol Support Profile				
LLS 1.0	Link Loss Service 1.0	●			
LLS 1.0.1	Link Loss Service 1.0.1			●	
LNP	Location and Navigation Profile	●		●	

Profile / Service		RL78/G1D		RX23W, RA4W1	RX23W
		78971	97611	134484	134527
LNS	Location and Navigation Service	●		●	
NDCS	Next DST Change Service	●		●	
OTP	Object Transfer Profile				
OTS	Object Transfer Service				
PASP	Phone Alert Status Profile	●		●	
PASS	Phone Alert Status Service	●		●	
PLXP	Pulse Oximeter Profile		●	●	
PLXS	Pulse Oximeter Service		●	●	
PXP 1.0	Proximity Profile 1.0	●			
PXP 1.0.1	Proximity Profile 1.0.1			●	
RCP	Reconnection Configuration Profile			●	
RCS	Reconnection Configuration Service			●	
RSCP	Running Speed and Cadence Profile	●		●	
RSCS	Running Speed and Cadence Service	●		●	
RTUS	Reference Time Update Service	●		●	
SCPP	Scan Parameters Profile	●		●	
SCPS	Scan Parameters Service	●		●	
TDS	Transport Discovery Service				
TIP	Time Profile	●		●	
TPS	TX Power Service	●		●	
UDS	User Data Service			●	
WSP	Weight Scale Profile			●	
WSS	Weight Scale Service			●	
MESH 1.0	Mesh Profile 1.0				
MESH 1.0.1	Mesh Profile 1.0.1				●
MMDL 1.0	Mesh Model 1.0				
MMDL 1.0.1	Mesh Model 1.0.1				●

2. Common operation

It's describes about necessary common operation to acquire Bluetooth qualification.

2.1 Bluetooth SIG Members registration and acquisition of personal account

Member registration to SIG is needed to use a license of Bluetooth and the brand. Operation on the web necessary to qualification acquisition and product registration (Declaration) becomes possible after member registration. This application note describes registration of "Adopter" member class.

2.1.1 Register the company to members of Bluetooth SIG (no charge)

- (1). Display the following URL by the browser. Click the [Apply for Adopter Membership] button at the middle of the displayed [Become a Bluetooth SIG Member] page.

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

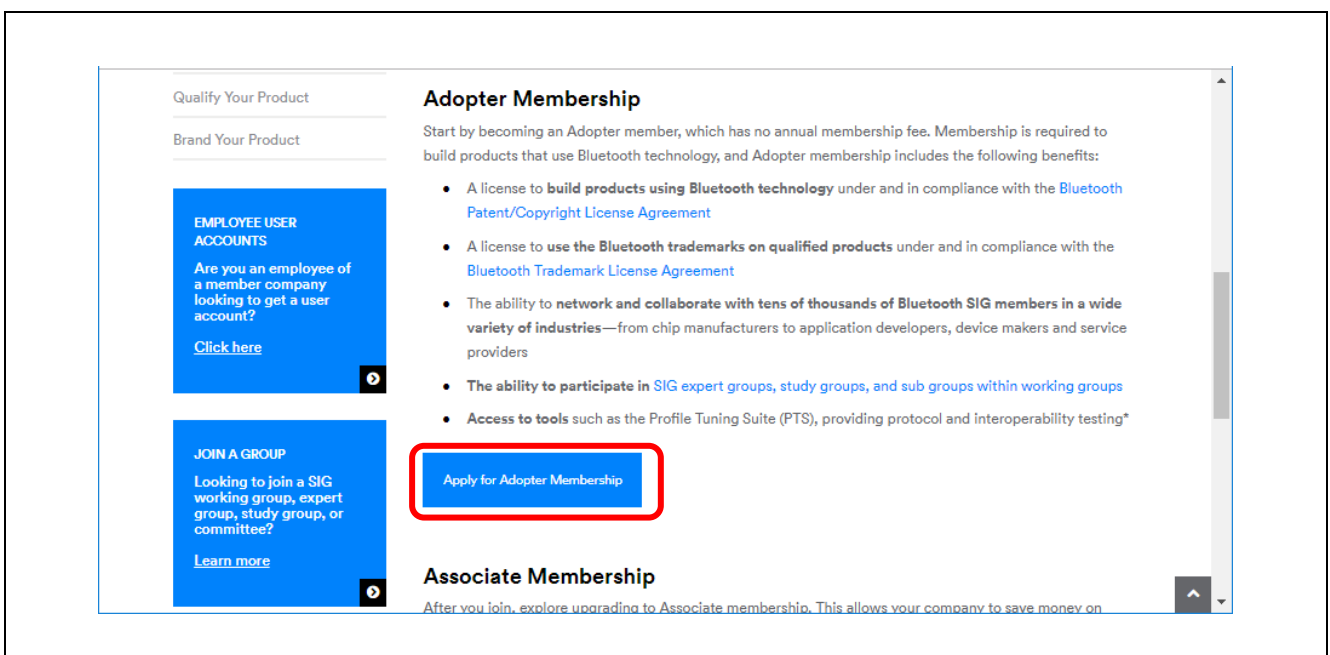


Figure 2-1 [Apply for Adopter Membership] button

- (2). Since the application page for Bluetooth SIG membership will be displayed, please check the details on the preparation described in [① Prepare your application materials].
 - Copy of corporate registration (PDF).
 - Power of attorney

If the applicant is different from the representative of the company, you may be asked for a power of attorney. Please prepare a letter of attorney in English that you can confirm that you have the authority to sign on behalf of the representative of the company. There is no official template, but the signature of the representative is mandatory.

- (3). Select the country with [★ Start Here:] at the bottom of the same page, enter the applicant's Email address, and click the [Start Membership Application] button to display the form input page.]

Figure 2-2 [Start Membership Application] button

- (4). Check the contents of the displayed form and enter necessary information.

Figure 2-3 Form input page

The form will be displayed in the order of [Part 1: Company Information] → [Part 2: My Information] → [Part 3: Office Locations].

For [Company's Legal Name] in [Part 1: Company Information], enter the name stated in the copy of corporate registration. [Company's Formation Documents] will upload the PDF file of the copy of corporate registration.

When you have completed all forms, click the [Review Application Details] button under the [Part 3: Office Locations] form to display the [Review, Sign, and Submit] page.

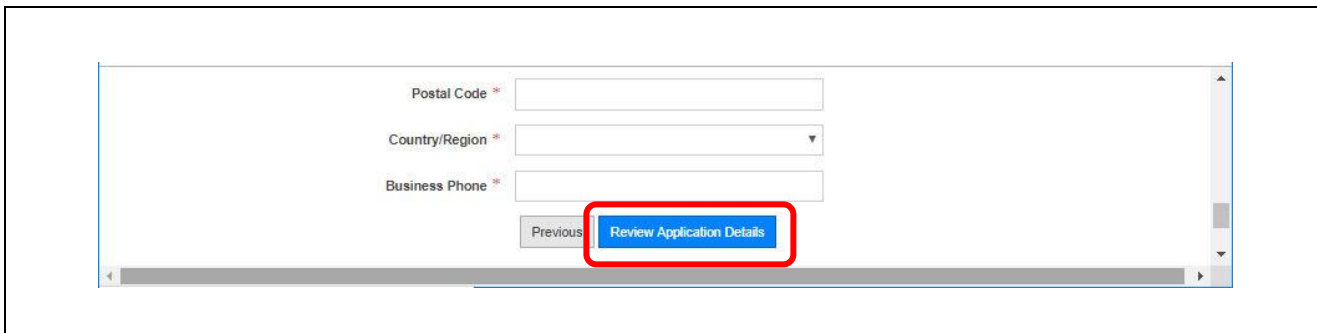


Figure 2-4 [Review Application Details] button

(5). When the [Review, Sign, and Submit] page is displayed, confirm the input contents.

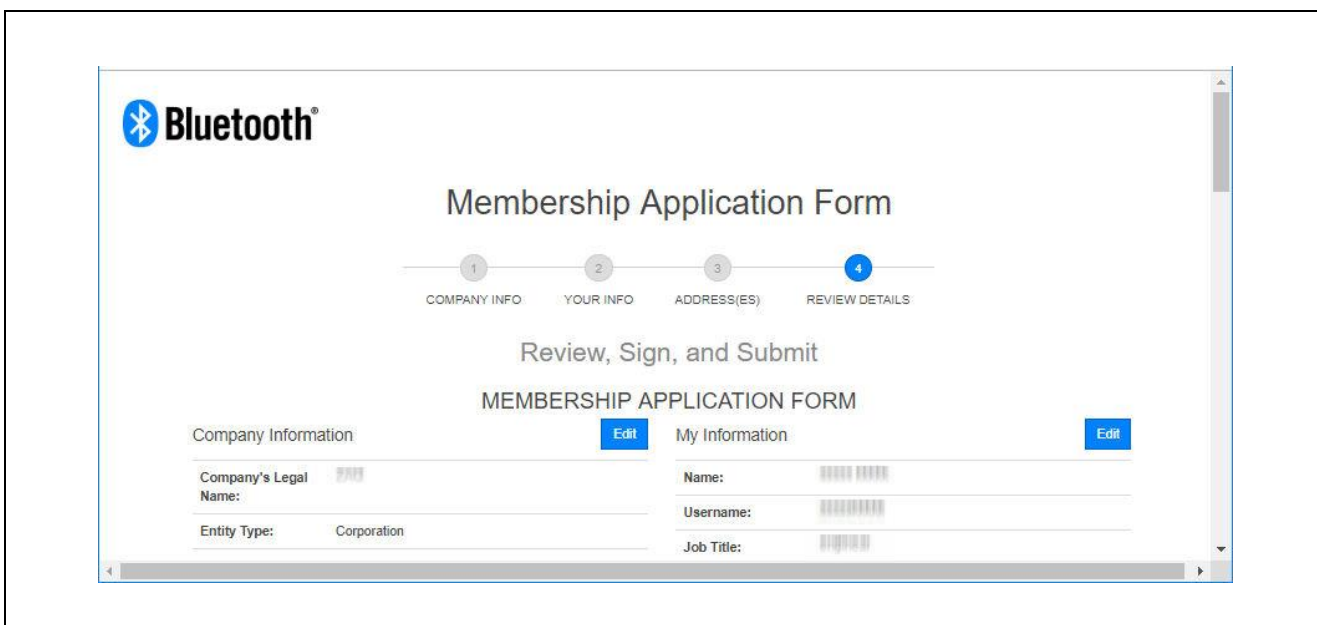


Figure 2-5 [Review, Sign, and Submit] page

(6). If there is no error in the input content, move to the [Signature and Submission] below than middle of the page, confirm the contents of the declaration statement of the membership agreement, check the check box at the beginning.

Signature and Submission

____ ("Signing Agent") is the _____ of _____ ("Applicant Company"). By typing his or her name or other symbol of Signing Agent's signature in the Signature Field below, Signing Agent:

- Personally certifies that the above information is true and correct, and Signing Agent has corrected any errors in the above information by using the "Edit" buttons;
- Represents and warrants that Signing Agent has been duly authorized to submit this Membership Application on behalf of Applicant Company; and that Signing Agent has read, fully understands, and is duly authorized to bind Applicant Company to each of the following hyperlinked agreements (collectively, the "Membership Agreements"): (1) the [Bluetooth SIG Membership Commitment Agreement](#), (2) the [Bluetooth SIG Patent/Copyright License Agreement](#), and (3) the [Bluetooth SIG Trademark License Agreement](#).
- Represents and warrants that Applicant Company does not, by its governing documents or other applicable law, require more than one signatory, a company stamp or seal, or a witnessed signature in order to be legally bound to the Membership Agreements.
- Agrees on behalf of Signing Agent and Applicant Company to contract in English and electronically, adopts the characters or symbols input in the signature field below as Signing Agent's signature, with the same effect as an ink signature, and electronically signs each of the Membership Agreements.
- Agrees, on behalf of Applicant Company, that Applicant Company will comply with the Membership Agreements.
- Agrees to the [Bluetooth SIG Terms of Use](#) ("TOU") and that all use of any account issued to Signing Agent by Bluetooth SIG and Bluetooth SIG's websites and all applications, databases, software, plug-ins, test scripts, tools, and services that Signing Agent may access with his or her user account is subject to and will be in compliance with the TOU, the Membership Agreements, and all other policies and procedures of Bluetooth SIG.
- Certifies that Signing Agent understands that the Membership Application Form is an offer by Applicant Company to enter into the Membership Agreements that may be accepted or rejected by Bluetooth SIG in its sole discretion and that Applicant Company will not become a member and Bluetooth SIG has not entered into the Membership Agreements with Applicant Company until Signing Agent receives a written notification (which may be by email) from Bluetooth SIG that Applicant Company's application has been accepted and membership issued.

If any of the foregoing is not correct or Signing Agent does not agree and certify to the foregoing, Signing Agent must exit the Membership Application Form without signing.

Figure 2-6 [Signature and Submission]

Finally sign the [Signature] text box under the declaration and click the [Signature Confirmed - Submit Application] button to complete the online process.

If any of the foregoing is not correct or Signing Agent does not agree and certify to the foregoing, Signing Agent must exit the Membership Application Form without signing.

FORM

Signature:

By:

Its:

Date: 2018-12-13

Figure 2-7 [Signature Confirmed - Submit Application] button

When the application is accepted, the applicant will receive an Email from the person in charge of the Bluetooth SIG, so please submit a power of attorney if requested.

2.1.2 Acquisition of the account of the member company's employee (no charge)

- (1). Display the following URL by the browser, click the [Click here] link or the [▶] mark of the [EMPLOYEE USER ACCOUNTS] in the middle of the displayed page.

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

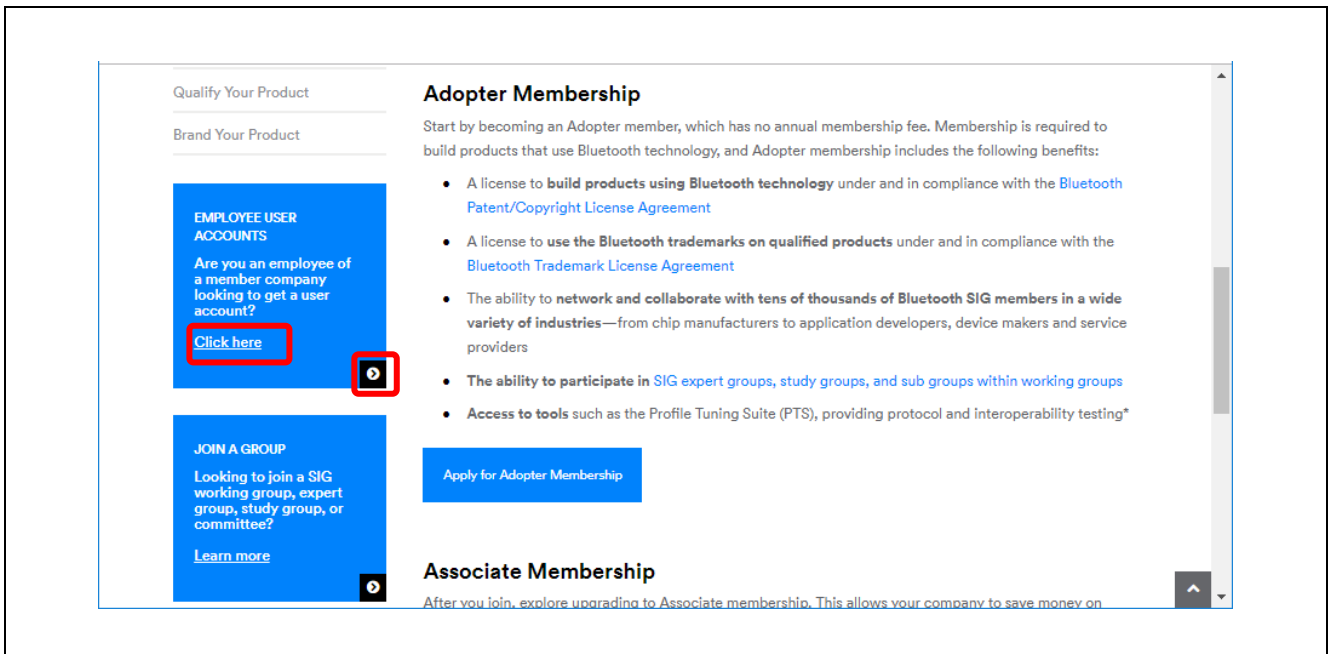


Figure 2-8 Apply for employee user account

- (2). In the text box on the displayed the [User Account Application] page, enter the Email address of the employee who applies for the account and click the [Submit Email Address] button.

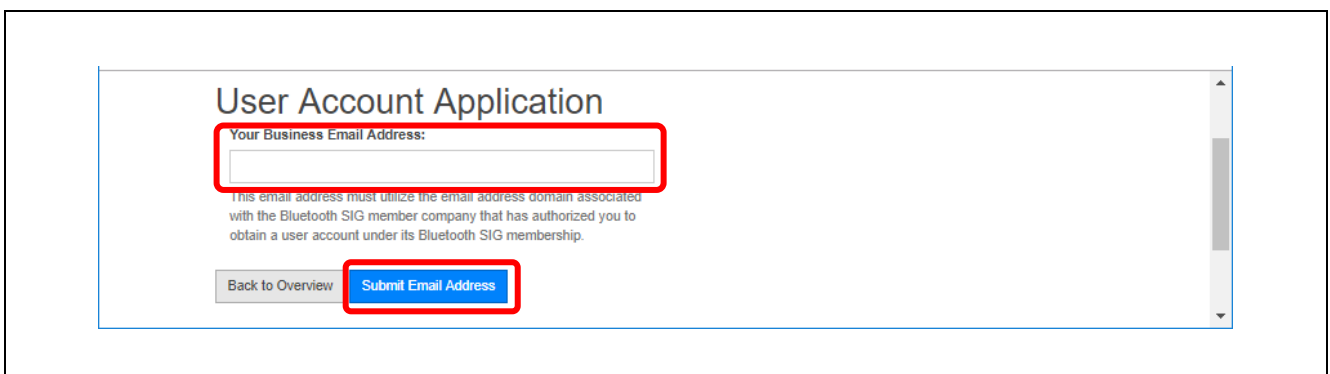


Figure 2-9 [User Account Application] page

- (3). A registration confirmation Email will be sent from the Bluetooth SIG to the account applicant. Click on the URL listed in the Email and enter the "My Information" on the opened WEB page.
- (4). After completing the entry you will receive an Email asking for the creation of a password so please access the URL stated in the Email and complete the creation of the password. Acquisition of the employee's user account is complete with this.

(5). By clicking the [Login] at the upper left of <<https://www.bluetooth.com>> and entering the user name and password on the [Log In] page opened, you will be accessible to the member page.

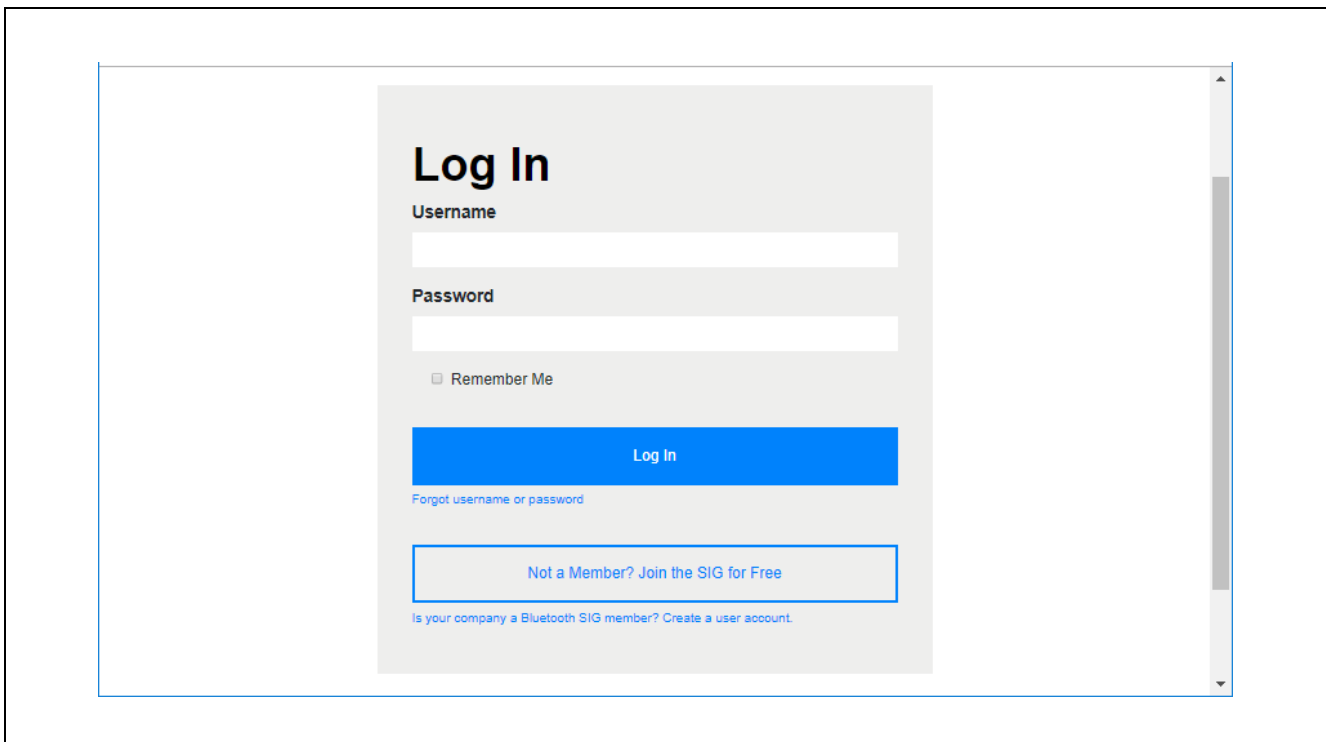


Figure 2-10 [Log In] page

2.2 Purchase of Declaration ID

When product registering (Declaration) by referring to the Qualified design, it is necessary to purchase Declaration ID. Below is the Web operation when the application company pays purchase cost directly to Bluetooth SIG.

Notes: 1. When requesting remittance to a certification body, please follow the instructions of the certification body.

2. For the purchase procedure, please use the same user account as "3. Product Registration (Declaration)" described later.

(1). After log in to <<https://www.bluetooth.com>>, starting the Launch Studio from the following URL and select the [Manage Declaration IDs] tab.

<https://launchstudio.bluetooth.com>

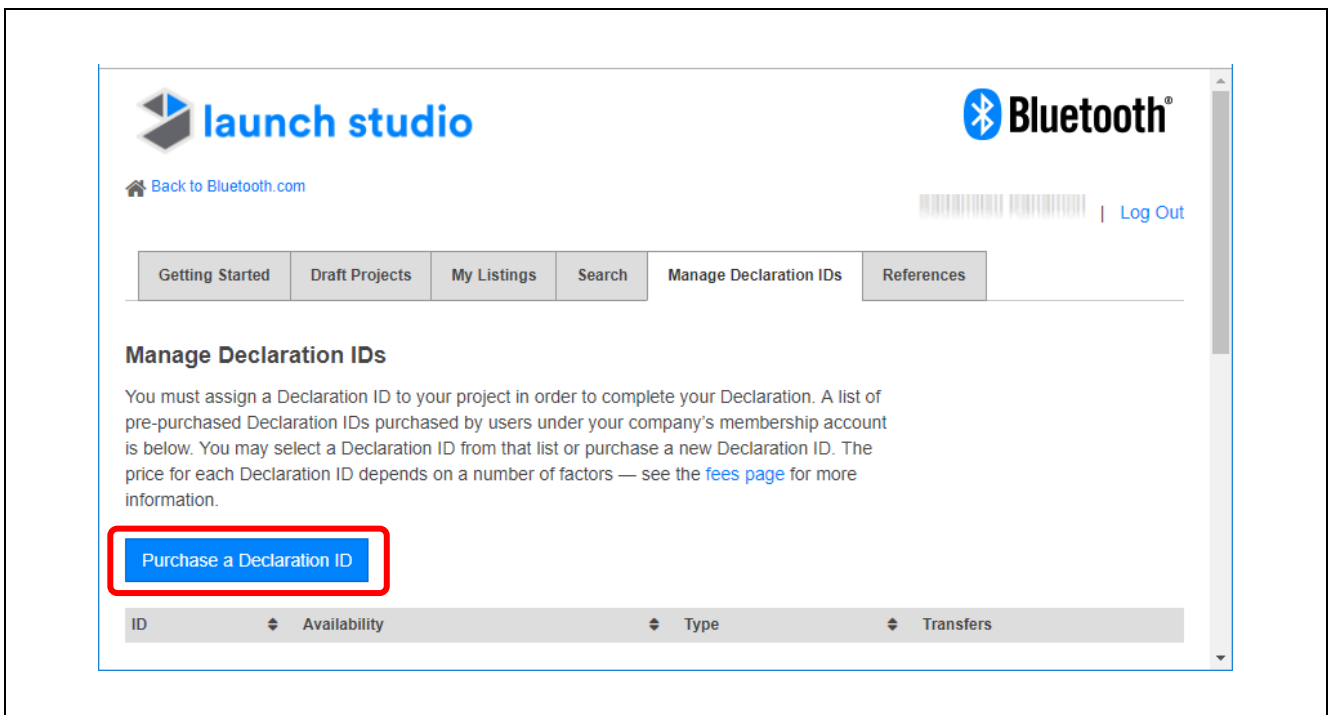


Figure 2-11 [Manage Declaration IDs] tab

Click the "[fees page](#)" in the description to see the price of the Declaration ID. Click the [Purchase a Declaration ID] button on the left side to display the [Purchase a Declaration ID] panel.

(2). Enter necessary items to the displayed [Purchase a Declaration ID] panel.

- Select [Standard] for [Declaration Type].
- Enter "1" in [Quantity].
- In [Payment Method], select [Credit Card] or [Invoice]. The following input items change according to the selection contents of [Payment Method], so please enter the necessary items for each. Items related to company address are automatically entered from user account information.

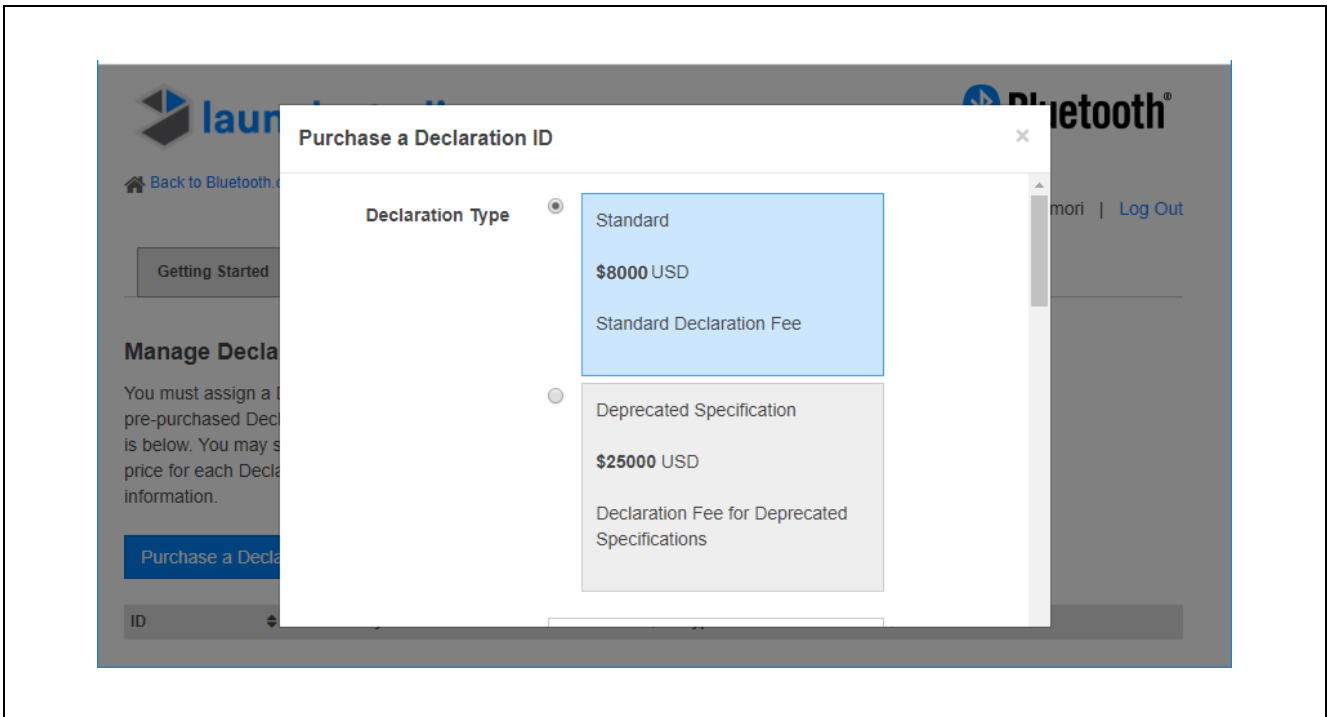


Figure 2-12 [Purchase a Declaration ID] panel

- (3). When all input is completed, click the completion button at the bottom of the panel. The completion button changes depending on the item selected in [Payment Method]. When [Credit Card] is selected, it becomes [Purchase Declaration ID], and if you select [Invoice] it will be [Create Invoice]. The payment procedure when [Credit Card] is selected is now complete.

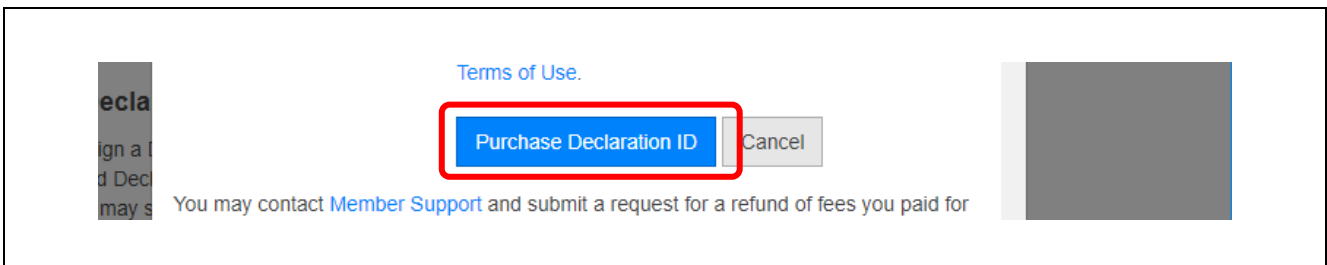


Figure 2-13 [Purchase Declaration ID] button

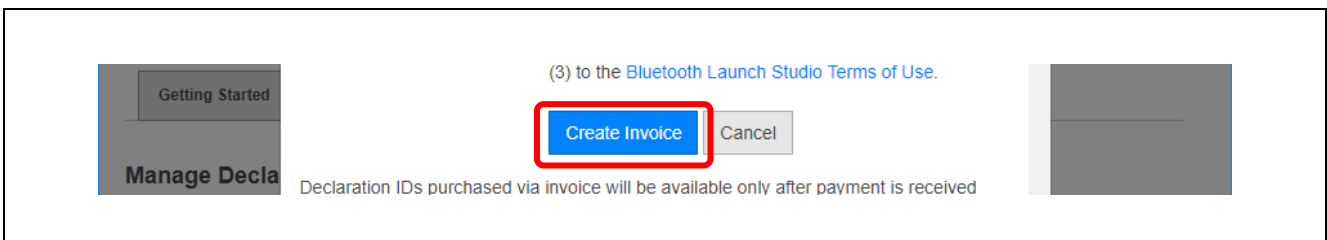


Figure 2-14 [Create Invoice] button

Click on the [Create Invoice] button to open Invoice PDF file and save it. (The same invoice is also attached to the Email sent from the Bluetooth SIG to the Invoice applicant.)

Please make overseas remittance procedure to the account described in Invoice.

Note: Please write Invoice number "INVxxxxx" of the top right of the Invoice in the telegram (message) column of the overseas remittance request form submit to the bank. If this number is not described, Issuance destination of the Declaration ID becomes the unknown.

Bluetooth

Sales/Marketing Department
 Renesas Electronics Corporation
 3-20-1, Anagiri-cho
 Himekawa-ku, Tokyo 187-8588
 Japan

Invoice

Invoice # INV 18748
 Date: 05-NOV-2018
 P.O. #:
 ATTN:
 Due Upon Receipt

Description	Amount
BLUETOOTH DECLARATION FEE	
Declaration fee:	\$8,000.00 USD
Quantity:	1
INVOICE DATE - 05-November-2018	
MEMBER TYPE -	
TOTAL DUE (US DOLLARS)	\$8,000.00

WIRE TRANSFER DETAILS: Bank Name: BMO Harris Bank, N.A.
 USD CHECK MADE PAYABLE TO: Bluetooth SIG, Inc.
 INVOICE CONTACT: accounting@bluetooth.com

Figure 2-15 Invoice sample

You can confirm the Declaration ID you purchased on the [Manage Declaration IDs] tab of the Launch Studio.

3. Product Registration (Declaration)

3.1 Registering a device that implements BLE microcomputer

This section describes how to register (Declaration) a device mounting with a BLE microcomputer as a Bluetooth product. Purchase of Declaration ID is required for product registration. Refer to "2.2 Purchase of Declaration ID" and implement the necessary procedures.

When Implement the BLE microcomputer, the characteristics may change due to design modification of RF part. Perform the RF-PHY test with the Bluetooth Qualification Test Facility (BQTF) in the following procedure, prove that there are no problems in the characteristics, and then register the product.

(1). Ask BQTF for RF-PHY test and Bluetooth Qualification Consultants (BQC) support.

Select BQTF from the following URL.

<https://www.bluetooth.com/develop-with-bluetooth/qualification-listing/qualification-test-facilities>

When ask to BQTF submit the following information.

- Business card information of client
- Company's Bluetooth SIG member class (Adopter / Associate)
- Reference qualified design (QDID)
Report the QDID to be combined to the product to be registered (The following is an example of case of Implement the RL78/G1D)
 - Profile Subsystem : 78971 (when supporting PLXP / PLXS added 97611)
 - End Product : 122047
- Design modification details of RF part (selected from below)
 - Dead copy (C1)
 - Change of pattern layout (Only RF pattern from RF output terminal of IC to antenna (including antenna change)) (C2)
 - Pattern layout change (New PCB pattern including RF part) (C3)
 - Changes of major parts affecting high-frequency characteristics such as quartz crystal unit (C4)
- Preferred date of registration complete

(2). Perform RF-PHY test at the BQTF.

- In the case where design change contents of the RF part are (C1) and (C2)
It is necessary to test two items, Output Power and Receiver Sensitivity.
- In the case where design change contents of the RF part are (C3) and (C4)
Standard 10 items test is required.

(3). Perform product registration.

If the test result is judged as a pass by BQC, follow the instructions of BQC and perform the product registration operation on the Bluetooth SIG WEB site. After registration operation, start Launch Studio from the following URL, display the "My Listings" tab page, and it is completed if registered products are displayed in the list.

<https://launchstudio.bluetooth.com>

(4). Keep of compliance folder CD-R.

After product registration electronic media (CD-R) with compliance folder (A set of certification documents such as Test Report of RF-PHY) registered will be sent from BQTF and please keep it.

Note: Apart from RF-PHY testing fee, we need compliance folder creation fee and BQC support fee. Please ask BQTF for cost estimate.

3.2 Registering a device that implements BLE module

This section describes how to register (Declaration) a device mounting the BLE module as a Bluetooth product. Purchase of Declaration ID is required for product registration. Refer to "2.2 Purchase of Declaration ID" and perform necessary procedures.

3.2.1 Product registration (Declaration)

After purchasing the Declaration ID, please perform product registration operation on the Bluetooth SIG WEB site as follows.

- (1). After log in to <<https://www.bluetooth.com>>, select [Qualify Your Product] in the [DEVELOP WITH BLUETOOTH] menu.

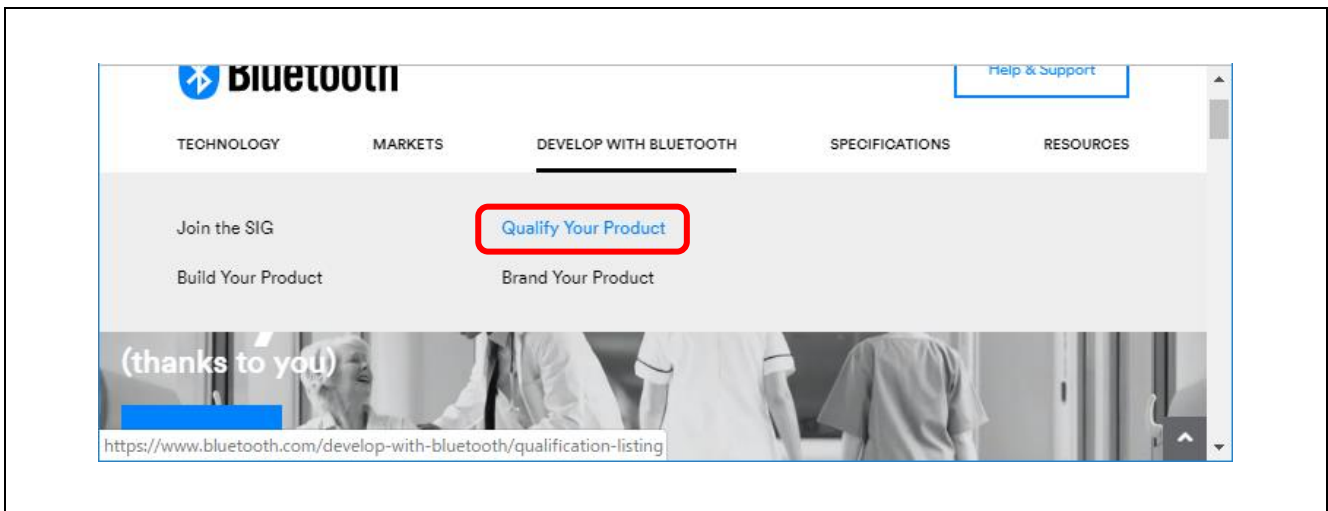


Figure 3-1 [DEVELOP WITH BLUETOOTH] menu

- (2). Click the [Path 1: Qualification Process with No Required Testing] button at the middle of the displayed [Qualify Your Product] page.

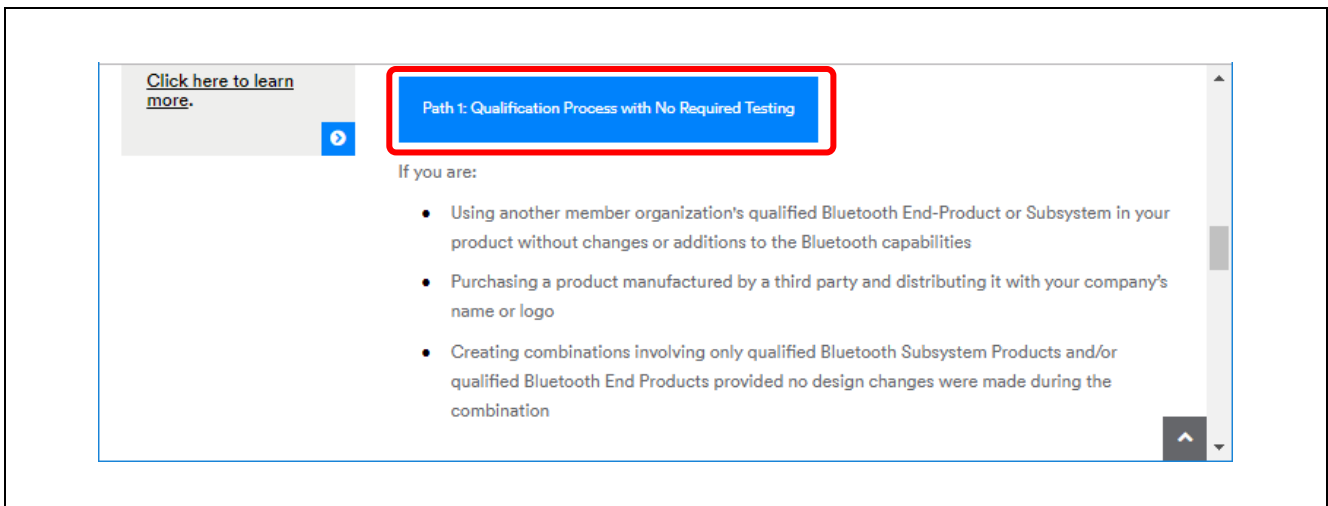


Figure 3-2 [Path 1: Qualification Process with No Required Testing] button

(3). Enter the basic information of the project on the displayed page.

Figure 3-3 [Project Basics] input example

- In [Project Name], enter any project name.
- Enter the QDID of the BLE module in [Referenced Qualified Design].
(e.g) For BLE module RY7011, enter QDID "82194"
When inputting, the search result will be displayed automatically, so select it.
If there are more QDIDs to combine, enter them.
(e.g) When support PLXP / PLXS, enter QDID "97611" additionally.
- When input is completed, click the [Save and continue to Product Declaration] button in the lower left.

(4). When the [Product Declaration] page is displayed, set "Listing Date" (Date on which you want to display the registered product in the public list database) in the [Required for submission, YYYY-MM-DD] text box. "Listing Date" can also be set using the calendar displayed by clicking on the text box.

Figure 3-4 [Product Declaration] page

Click [+Add a Product] button displayed at the bottom of the page after setting "Listing Date".

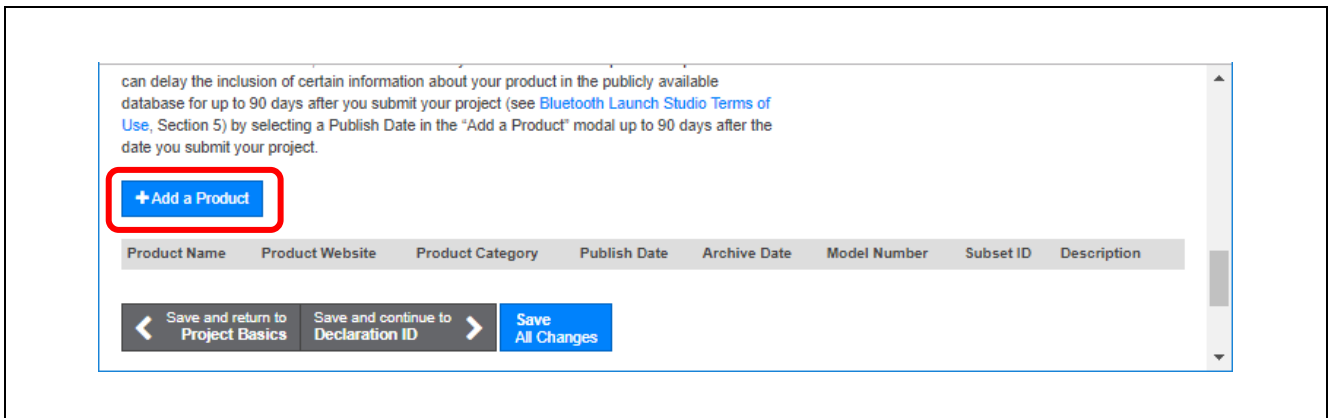


Figure 3-5 [+Add a Product] button

The [Add/Edit products] panel will be displayed, please enter product information. When input is completed, click [Save] button.

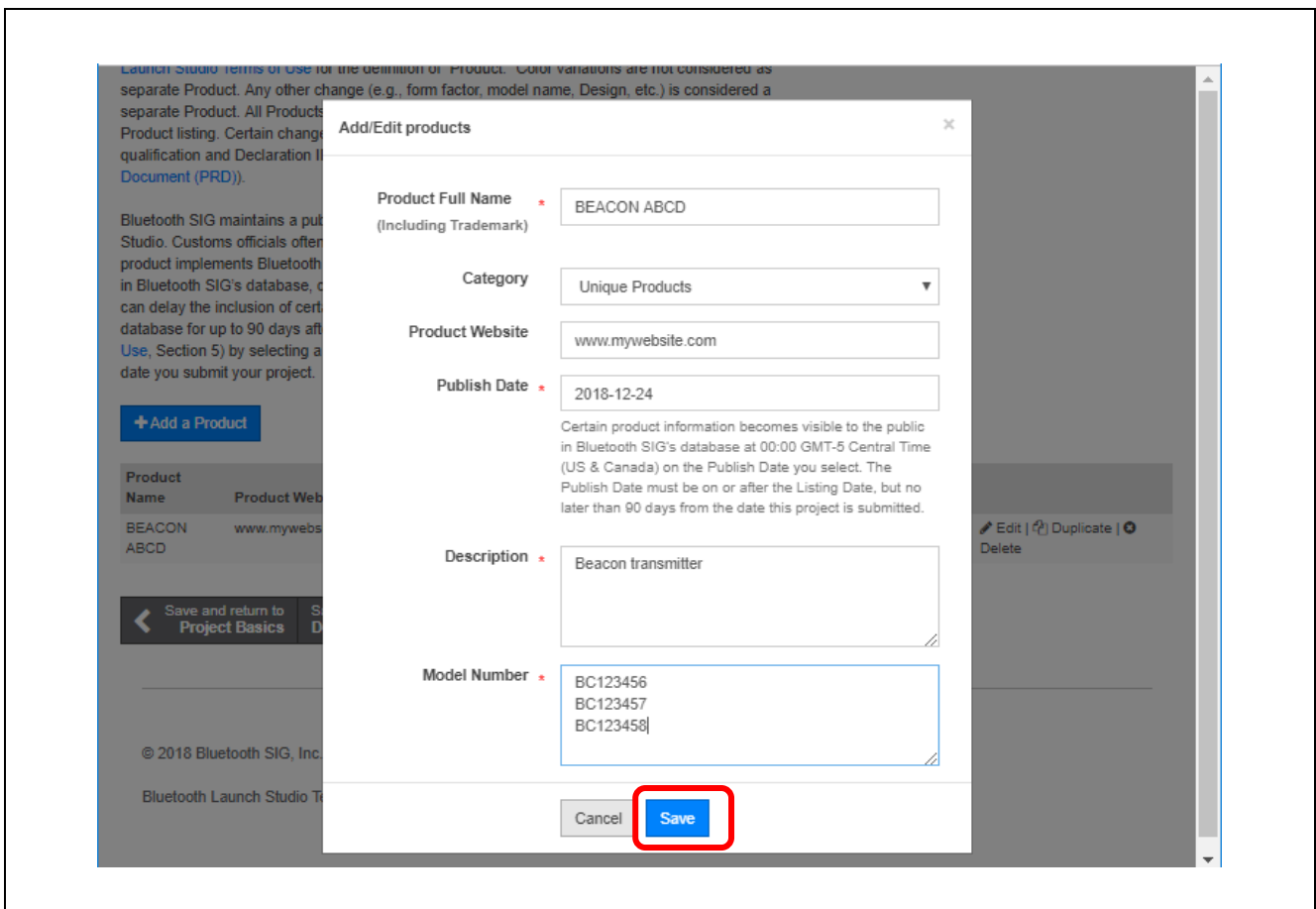


Figure 3-6 [Add/Edit products] panel

- (5). Confirm that the input contents are displayed in the product list and click the [Save and continue to Declaration ID] button.

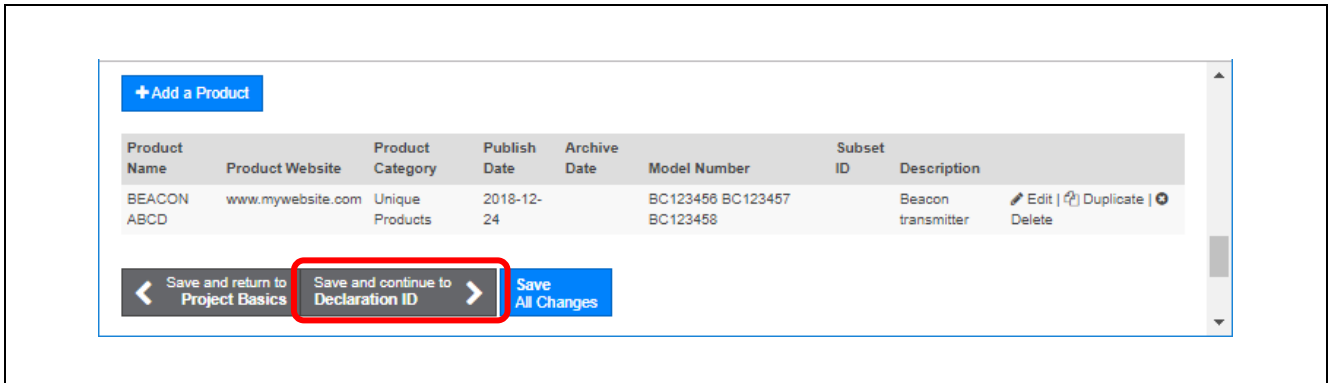


Figure 3-7 Product List

- (6). A list of available Declaration IDs is displayed. Select the ID to be used for this product registration and click the [Save and continue to Review] button.

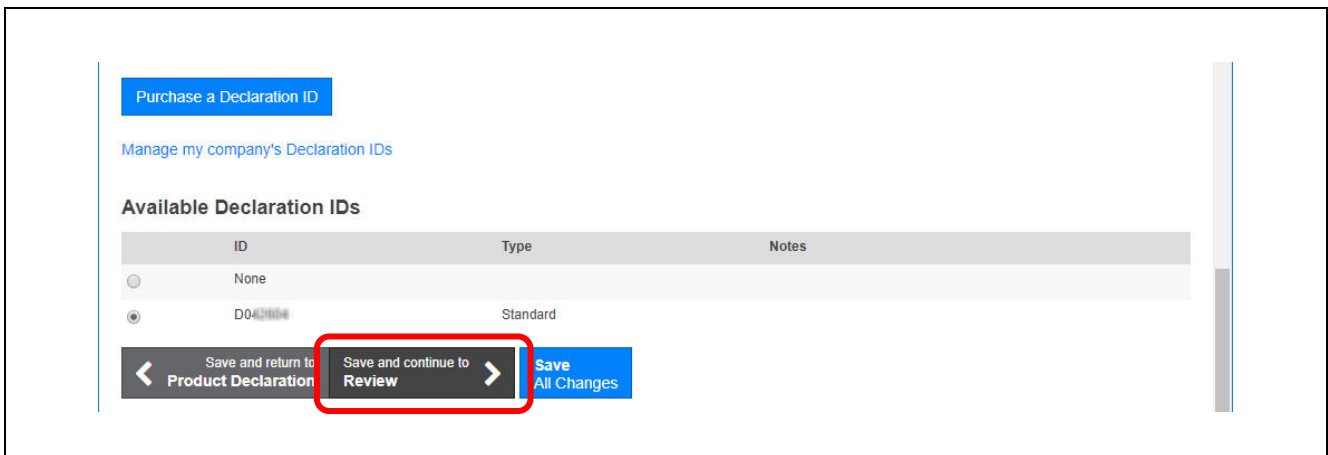


Figure 3-8 [Available Declaration IDs] list

- (7). Since the [Review] page is displayed, confirm that the contents of [Project Details] are correct.



Figure 3-9 [Project Details]

If the contents are correct, check the declaration statement at the bottom of the page and check the check box at the beginning of the declaration statement.

Finally sign the [Signature] text box below the declaration and click the [Signature Confirmed - Complete Project & Submit Product (s) for Qualification] button to complete the online procedure.

Declaration of Compliance described in the [Program Reference Document \(PRD\)](#) and [Declaration Process Document \(DPD\)](#).

- I am authorized by Company to submit all of the information and materials included in this project and all information and materials are true, complete, and accurate.
- Company does not, by its governing documents or other applicable law, require more than one signatory, a stamp or seal, or a witnessed signature to be legally bound.
- I agree on behalf of Company to contract in English and electronically, and adopt the characters and symbols input in the signature field below as my signature, with the same effect as an ink signature.
- The products included in this project are owned by Company and, if marketed or distributed, are done so under a name that uniquely identifies Company as the source of the Product.
- The product(s) included in this project and the corresponding Qualified Designs comply with the [Bluetooth Launch Studio Terms of Use](#) and the versions of the Bluetooth Specifications referenced in the project.

If any of the foregoing is not correct or you do not agree, you must exit this form without signing.

Signature:

Submit your project and documentation to the Bluetooth SIG.

Figure 3-10 [Signature Confirmed - Complete Project & Submit Product (s) for Qualification]

Registered products can be confirmed on the Launch Studio's [My Listings] tab.

3.2.2 Add a Product

This section describes how to add another device implementing the BLE module to the list registered (Declared) with "3.2.1".

- (1). After log in to <<https://www.bluetooth.com>> using the same account as 3.2.1, to start Launch Studio from the following URL and select the [My Listings] tab.
<https://launchstudio.bluetooth.com>
- (2). Click the Declaration ID number of the list created in 3.2.1 to display the [Declaration Details] page.
- (3). Click the [+Add a Product] link on the left side of the page to start the "Add Products" process.
- (4). Click the [+Add a Product] button at the bottom of the displayed page.
- (5). The [Add/Edit products] panel will be displayed, please enter product information. When input is completed, click [Save] button.
- (6). Confirm that the input content is displayed in the product list and click [Continue to Review & Submit] button.
- (7). Since the [Review] page will be displayed, confirm that the contents of [Product Listing (s)] are correct.
If the contents are correct, check the declaration statement at the bottom of the page and check the check box at the beginning of the declaration statement.
Finally sign the [Signature] text box below the declaration statement and click the [Signature Confirmed - Complete Project & Submit Product (s) for Qualification] button to complete the online procedure.

Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Jun.15.16	–	First edition issued
1.10	Jan.15.19	–	Full revision by the information as of Dec 2018
1.20	Nov.01.19	–	Added information on RX23W Group
1.30	May.07.20	1	Added RA4W1 group to Target Device
		3	Added RA4W to the BLE microcomputer / module column in Table 1-1
		3-5	Added RA4W1 to the title line in Table 1-2
		15	3.1 (2): "All items" changed to "Standard 10 items"

General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

The following usage notes are applicable to all Microprocessing unit and Microcontroller unit products from Renesas. For detailed usage notes on the products covered by this document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

1. Precaution against Electrostatic Discharge (ESD)

A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity.

Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.

2. Processing at power-on

The state of the product is undefined at the time when power is supplied. The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the time when power is supplied. In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the time when power is supplied until the reset process is completed. In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the time when power is supplied until the power reaches the level at which resetting is specified.

3. Input of signal during power-off state

Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.

4. Handling of unused pins

Handle unused pins in accordance with the directions given under handling of unused pins in the manual. The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of the LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible.

5. Clock signals

After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is stabilized. When the clock signal is generated with an external resonator or from an external oscillator during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Additionally, when switching to a clock signal produced with an external resonator or by an external oscillator while program execution is in progress, wait until the target clock signal is stable.

6. Voltage application waveform at input pin

Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between V_{IL} (Max.) and V_{IH} (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between V_{IL} (Max.) and V_{IH} (Min.).

7. Prohibition of access to reserved addresses

Access to reserved addresses is prohibited. The reserved addresses are provided for possible future expansion of functions. Do not access these addresses as the correct operation of the LSI is not guaranteed.

8. Differences between products

Before changing from one product to another, for example to a product with a different part number, confirm that the change will not lead to problems. The characteristics of a microprocessing unit or microcontroller unit products in the same group but having a different part number might differ in terms of internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

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