



Migrating from the 1st to the 2nd revision of nRF51822

nWP-018

White Paper v2.0

This document describes what to consider when migrating from the 1st IC hardware revision of nRF51822 to the 2nd IC hardware revision during development and/or production.

Before continuing to read this document, we recommend that you read the *nRF51 Series Compatibility Matrix* document available on www.nordicsemi.com.

The new versions of nRF51822 are:

| Device marking | | Description | Build codes replaced by this version |
|-----------------|------------------|--|--------------------------------------|
| Package/Variant | Build code | | |
| QFAA | Gx0 ¹ | 48 pin QFN device with 256 kB FLASH, 16 kB RAM | Cx |
| QFAB | Bx0 ¹ | 48 pin QFN device with 128 kB FLASH, 16 kB RAM | A0 |
| CEAA | Dx0 ¹ | 62 balls CSP device with 256 kB FLASH, 16 kB RAM | B0 |

1. The x in the build code could be any digit between 0..9.

1 Introduction

The 2nd nRF51822 IC revisions are now available to purchase. These versions of the IC include a substantial amount of new features and improvements. Because of the significant improvements in these versions, there are some factors you need to be aware of when migrating from an earlier revision of the IC to one of these latest revisions.

A list of the improvements and new features on the 2nd IC revision of nRF51822 are documented in *PCN-082 v1.0*. For details on fixed anomalies see the *nRF51822 PAN*.

When making a product based on an nRF51 series IC, it is always recommended to use the latest revision of the IC. If a new revision of an IC is released during your development cycle you should consider migrating to that revision.

1.1 Documentation

The following documentation is important reference material in regards to version differences of the IC:

| Document | Description |
|--|--|
| <i>nRF51 Series Compatibility Matrix</i> | The nRF51 Compatibility Matrix shows the compatibility between IC revisions, documentation, SoftDevices, SoftDevice Specifications, SDK's, development kits, and Qualified Design IDs that applies for the different IC and SoftDevice combinations. |
| <i>nRF51 SDK documentation release notes</i> | This is available in the Documentation subfolder of the SDK installation folder. It is recommended to read this when upgrading the SDK. |
| <i>S110 nRF51 SoftDevice release notes</i> | It is recommended to read this when upgrading the SoftDevice. |
| <i>S110 migration document</i> | This is available in the SoftDevice folder. It describes how to migrate to new versions of the S110. |
| <i>S120 nRF51 SoftDevice release notes</i> | It is recommended to read this when upgrading the SoftDevice. |
| <i>S120 migration document</i> | This is available in the SoftDevice folder. It describes how to migrate to new versions of the S120. |
| <i>nRF51822 Product Specification</i> | Contains a description of the hardware, modules, and electrical specifications specific to the nRF51822 IC. |
| <i>nRF51 Series Reference Manual</i> | Contains a functional description of all the modules and peripherals supported for all the ICs in the nRF51 series. |
| <i>nRF51822 PAN</i> | The Product Anomaly Notice (PAN) describes product anomalies present in the IC, and shows which anomalies are fixed between revisions of the IC. |
| <i>PCN-082</i> | The Product Change Notice (PCN) shows the changes from one revision to the next. These changes are not anomaly fixes, but could still be important to know about when moving to a new revision. |

2 How to identify the hardware version

There are several ways that you can identify the hardware revision of your IC.

Markings on the IC

The quickest way to identify the hardware revision of the IC is by looking at the markings on the IC. If you have access to an IC (including an IC on a PCB from a development kit or evaluation kit) simply read the markings on the top. See Chapter 10 'Ordering information' in the *nRF51822 Product Specification* for details on package markings.

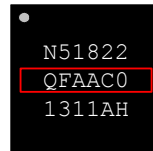


Figure 1 IC markings on the top of the IC

Using nRFgo Studio

By using nRFgo Studio, it is also possible to read the hardware revision of an IC that is on a PCB from a development or evaluation kit and connected to a computer. **Figure 2** shows you where to find the hardware revision (highlighted in red) in nRFgo Studio:

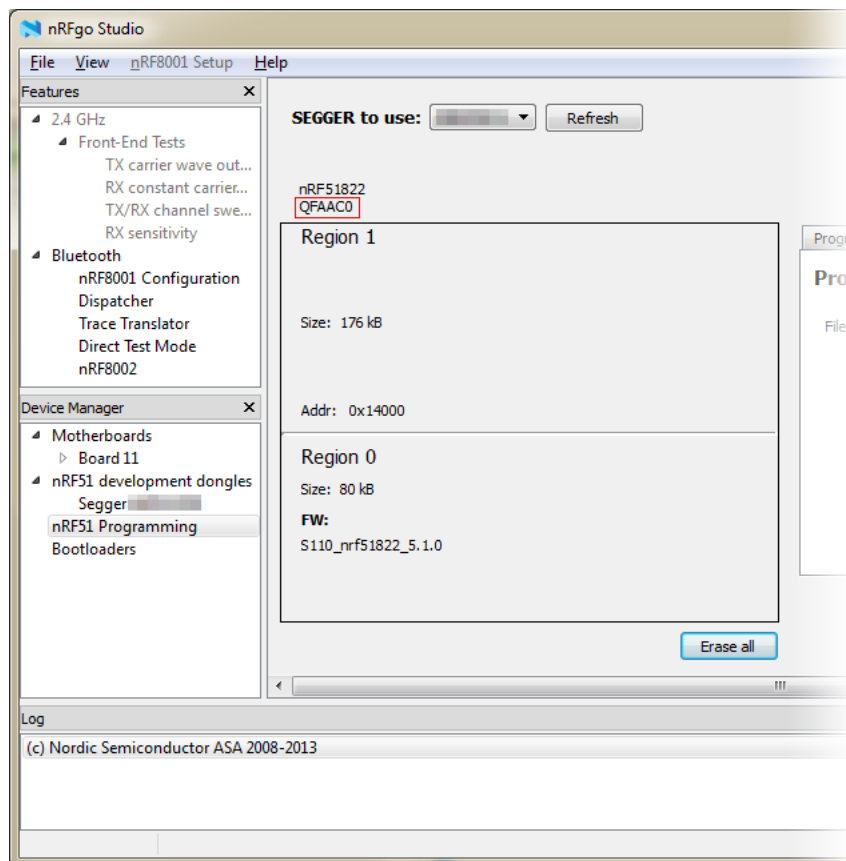


Figure 2 Location of hardware revision details (highlighted in red) in nRFgo Studio

Reading the HWID field in the CONFIGID register

The HW revision can also be found by reading out the HWID field in the CONFIGID register of the FICR (see chapter 4 “Memory” and chapter 6 “Factory Information Configuration Registers (FICR)” in the *nRF51 Series Reference Manual* for more details on the FICR).

The easiest way to do this is to use the J-Link debugger hardware together with the nrfjprog command line tool, which is available if you have installed the nRF51 SDK:

1. Open the Windows command line, and navigate to the default nrfjprog folder, **c:\program files (x86)\Nordic Semiconductor\nrf51\bin**.
2. Run the following command: `nrfjprog --memrd 0x1000005C --n 4`.
3. If you have more than one nRF51822 board connected a window appears allowing you to select between the boards.
4. The HWID is the four last hexadecimal digits of the return value.

```
C:\Program Files (x86)\Nordic Semiconductor\nrf51\bin>nrfjprog --memrd 0x1000005C --n 4
0x1000005C: FFFF001D          !...!
```

Figure 3 nrfjprog used to read out the HWID, in this case the result is 0x001D

3 Telecommunications regulatory requirements and *Bluetooth*[®] certifications

Migrating to the latest revision of the same variant of the IC.

The reference layout for nRF51822-QFAA, nRF51822-QFAB (nRF51822-QFAx-DF) and nRF51822-CEAA (nRF51822-CxAx-DF) pass all telecommunications regulatory bodies` requirements with the stated product changes with no discernible performance change. A reassessment of design performance due to applicable telecommunications regulatory requirements is required for any product not identical to the referenced layout.

A reassessment means comparing measurements on your design using the build codes that already have teleregulatory approval:

- nRF51822-QFAA devices: Compare build code C0 with Gx0¹.
- nRF51822-QFAB devices: Compare build code A0 with Bx0¹.
- nRF51822-CEAA devices: Compare build code B0 with Dx0¹.

Consider the measurement accuracy when you are evaluating the results. Using ETSI as an example: If the results of the comparison are within the ETSI guidance published in the document "ETSI EN 300 328 v1.8.1 (2012-04)" then the measurements are considered equal.

If the levels are found to be different on your design but are still within regulatory limits, please contact Nordic Semiconductors technical support for guidance.

Bluetooth RF PHY conformance reassessment is recommended for all designs not identical to the Nordic referenced layouts published on www.nordicsemi.no.

1. The x in the build code could be any digit between 0..9.

4 Recommendations

It is recommended to migrate to the new revision of the IC as soon as possible. How to do that depends on which of the following scenarios apply.

Note: It is important to thoroughly test a new design before entering production.

Scenario 1:

Development started out on an earlier revision of the IC but production has not yet started.

Recommendation:

Get the development or evaluation kit that is based on the latest revision of the IC and migrate the design to the latest revision before entering production.

If the existing development is based on an SDK or SoftDevice that is not compatible with the new IC revision, it is necessary to update the design to use the updated SDK and/or SoftDevice, see the *nRF51 Series Compatibility Matrix* document available on www.nordicsemi.com for more information.

When upgrading to a new major version of either the SDK or the SoftDevice it might be necessary to make some changes to the application software to make it work. For example, migrating from version 4.x.x to 5.x.x of the SDK constitutes a change in the major version number, and can include API changes that will break backwards compatibility with existing software. Please see the SDK release notes for more details on the changes from between SDK versions.

For details on hardware changes and qualification requirements when migrating from the old to the new version, see *Chapter 3 "Telecommunications regulatory requirements and Bluetooth® certifications"* on page 5.

Scenario 2:

Development started out on an older revision of the IC and production has already started based on this revision.

Recommendation:

There are two options that you can choose from:

- Migrate to the latest relevant version of the SDK and SoftDevice for IC revision 2 to take advantage of all new features. When doing this it is critical that both the design and the IC revision is updated at the same time in the production line, or incompatibilities between the IC and the design could occur.
- Migrate to a version of the SDK and SoftDevice that supports both the old and new revision of the IC, see the *nRF51 Series Compatibility Matrix* document available on www.nordicsemi.com for more information. This will not necessarily provide access to the features available in the latest software, but will ensure that the design could be updated in production right away without having to wait for inventory on the new IC revision.

In either case it is critical that the design is updated before the new revision of the IC enter the production line.

4.1 Hardware recommendations

The external 12k pull down resistor on the SWDCLK line is now internal and can be removed.

5 Summary

It is always recommended to use the latest revisions of the hardware, SDK, and SoftDevice. In addition to useful new features most hardware and software updates bring with them critical bug fixes which, if not handled, could cause issues for the end product.

Once you have taken into account the considerations covered in this document, the migration from an earlier revision to one of the latest versions of the IC should be a relatively seamless process.

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Revision History

| Date | Version | Description |
|---------------|---------|---|
| February 2015 | 2.0 | <p>Updated content:</p> <ul style="list-style-type: none"> • Changed the title of the white paper. • Changed the introduction text on the front page. • <i>Section 1.1 “Documentation”</i> on page 2 • <i>Chapter 3 “Telecommunications regulatory requirements and Bluetooth® certifications”</i> on page 5 • <i>Chapter 4 “Recommendations”</i> on page 6 <p>Removed content:</p> <ul style="list-style-type: none"> • Chapter 3, ‘nRF51822 compatibility matrix’ |
| July 2014 | 1.3 | <p>Updated content:</p> <p><i>Table 1</i> on page 5</p> |
| May 2014 | 1.2 | Removed note in Introduction. |
| January 2014 | 1.1 | <p>Updated content:</p> <ul style="list-style-type: none"> • <i>Chapter 3 “Telecommunications regulatory requirements and Bluetooth® certifications”</i> on page 5. |
| November 2013 | 1.0 | First release. |