Migrating from the 2nd to the 3rd revision of nRF51822

nWP-021

White Paper v2.0

This document describes what to consider when migrating from the 2nd to the 3rd revision of the nRF51822 IC 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	Hx0[1]	48 pin QFN device with 256 kB FLASH, 16 kB RAM	FA0, GC0, Gx0[1]
QFAB	Cx0[1]	48 pin QFN device with 128 kB FLASH, 16 kB RAM	Bx0[1]
CEAA	Ex0[1]	62 balls CSP device with 256 kB FLASH, 16 kB RAM	DA0, Dx0[1]

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

1 Introduction

The latest nRF51822 revisions are now available for purchase. There are anomaly resolutions and some new features not changing the device functionality.

A list of the improvements and new features on the latest versions of nRF51822 are documented in *PCN-092* v1.0. For details on fixed anomalies see the *nRF51822 PAN* v3.x.

When starting a new design 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 strongly consider migrating to that revision. Products that are in production must also incorporate the latest IC revisions within the transitional period as described in PCN-092 v1.0 and in all cases there is a functionally and physically equivalent version of the IC to substitute in production.

1.1 Documentation

The following documentation is updated for the latest versions of nRF51 series ICs and is important reference material when migrating your applications in development.

Document	Description
nRF51 Series Compatibility Matrix	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.
nRF51 SDK documentation release notes	This is available in the Documentation subfolder of the SDK installation folder. It is recommended to read this when upgrading the SDK.
S110 nRF51 SoftDevice release notes	It is recommended to read this when upgrading the SoftDevice.
S110 migration document	This is available in the SoftDevice folder. It describes how to migrate to new versions of the S110.
S120 nRF51 SoftDevice release notes	It is recommended to read this when upgrading the SoftDevice.
S120 migration document	This is available in the SoftDevice folder. It describes how to migrate to new versions of the S120.
nRF51822 Product Specification	Contains a description of the hardware, modules, and electrical specifications specific to the nRF51822 IC.
nRF51 Series Reference Manual	Contains a functional description of all the modules and peripherals supported for all the ICs in the nRF51 series.
nRF51822 PAN	The Product Anomaly Notice (PAN) describes product anomalies present in the IC, and shows which anomalies are fixed between revisions of the IC.
PCN-092	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:

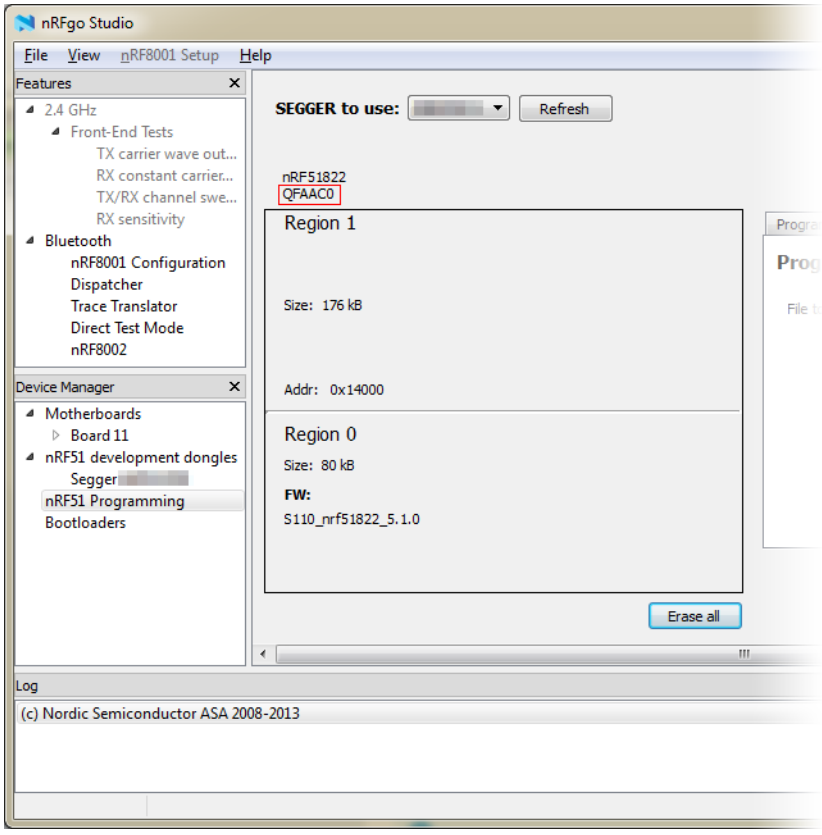

Figure 2 *Location of hardware revision details (highlighted in red) in nRFgo Studio*

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 downloaded and installed nRF51-Tools from our web site:

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.

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 Gx0 with Hx0[1].
- nRF51822-QFAB devices: Compare build code Bx0 with Cx0[1].
- nRF51822-CEAA devices: Compare build code Dx0 with Ex0[1].

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.

To take full advantage of the new features and improvements in the new IC revision it is recommended to use the very latest versions of the SDK and the SoftDevice.

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 with interfaces to later SoftDevices or SDK modules. 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 between SDK versions.

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

Scenario 2:

Development started out on the 2nd revision of the IC and production has already started or my design has been fully qualified and tested based on this revision and is production ready.

Recommendation:

There are two options that you can choose from:

- Migrate to the new IC revision and latest version of the SDK and SoftDevice to take advantage of all new features. When doing this it is critical that both the design and the IC revision are updated at the same time in the production line, or incompatibilities between the IC and the design could occur. Also make sure that you are referring to the correct QD ID (see the *nRF51 Series Compatibility Matrix* document available on www.nordicsemi.com for more information).
- Keep using the SoftDevice and SDK versions they have designed on, provided they are compatible with the new HW (see the *nRF51 Series Compatibility Matrix* document available on www.nordicsemi.com for SDK compatibility).

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

None.

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 bug fixes and improvements for optimal product performance.

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	**Updated content:** • Introduction text on the front page. • ***Section 1.1 "Documentation"*** on page 2 • ***Chapter 3 "Telecommunications regulatory requirements and Bluetooth® certifications"*** on page 5 • ***Chapter 4 "Recommendations"*** on page 6 **Removed content:** • Chapter 3, 'nRF51822 compatibility matrix' • Table 4, QDID combined listings
October 2014	1.0	First release.