

# **s112\_nrf52 release notes**

## **Introduction to the s112\_nrf52 release notes**

### **About the document**

These release notes describe the changes in the s112\_nrf52 from version to version.

The release notes are intended to list all relevant changes in a given version. They are kept brief to make it easy to get an overview of the changes. More details regarding changes and new features can be found in the s112\_nrf52 migration document (normally available for major releases only).

Issue numbers in parentheses are for internal use and should be disregarded by the customer.

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# s112\_nrf52\_6.1.0

The s112\_nrf52\_6.1.0 is the first S112 SoftDevice to support both nRF52810 and nRF52832.

Notes:

- The release notes list changes since the s112\_nrf52\_6.0.0 release.
- This SoftDevice is binary compatible to the s112\_nrf52\_6.0.0. Applications are therefore not required to be recompiled and memory requirements have not changed.

## SoftDevice Properties

- This SoftDevice is production tested for nRF52810 and nRF52832.
- This SoftDevice contains the Master Boot Record (MBR) version 2.2.2 (DRGN-9537).
- The combined MBR and SoftDevice memory requirements for this version are the same as for the s112\_nrf52\_6.0.0:
  - Flash: **100.0 kB** (0x19000 bytes).
  - RAM: **3.86 kB** (0xF70 bytes). This is the minimum required memory. The actual requirements depend on the configuration chosen at `sd_ble_enable()` time.
- The Firmware ID of this SoftDevice is 0x00B0.

## New Functionality

- SoftDevice
  - The SoftDevice variant, flash usage, reserved PPIs, and reserved interrupt priorities are now available at compile time to the application through new APIs (DRGN-9627).
  - An API is added to enable the application to remove an unused UUID entry from the UUID table (DRGN-10389).
- GAP
  - With the new `sd_ble_gap_adv_addr_get()` API, the application can now get the Bluetooth device address that is being used by the advertiser (DRGN-10470).

## Changes

- SoftDevice
  - On nRF52810, the time reserved by the SoftDevice is reduced by 297  $\mu$ s when performing a flash word write, and by 4.7 ms when performing a flash page erase. This increases the probability of successfully scheduled flash operations (DRGN-9048).
  - Improved documentation for the `NRF_ERROR_INVALID_STATE` error code (DRGN-9693).
  - When the SoftDevice is acting as a peripheral, and the RC oscillator is used as the LFCLK source, the configured RC calibration period can now be increased. By default, the SoftDevice will now increase the receive window if two consecutive packets are missed and will then perform RC calibration if necessary (DRGN-9852).
  - SoftDevice 112\_nrf52\_6.0.0 accepted an advertising interval larger than `BLE_GAP_ADV_INTERVAL_MAX` as an experimental feature. However, this configuration could make the SoftDevice assert. Now, the SoftDevice will return `NRF_ERROR_INVALID_PARAM` if the application configures an advertising interval larger than `BLE_GAP_ADV_INTERVAL_MAX` (DRGN-10322).
  - Radio utilization for multi-protocol applications are improved significantly as the time allocated for a normal Radio Timeslot request session has decreased by up to 1 ms (DRGN-10405).
- GATT
  - `sd_ble_gatts_rw_authorize_reply()` now allows sending the 0xFC (Write Request Rejected) profile error code which was introduced in the Bluetooth Core Specification Supplement CSSv7 (DRGN-10373).
- LL
  - Instead of disconnecting, the SoftDevice will now respond with `LL_UNKNOWN_RSP` when receiving control procedure PDUs with invalid lengths (DRGN-9997).

## Bug Fixes

- SoftDevice
  - Fixed an issue where a HardFault could generate a new HardFault if the application called a NULL pointer (DRGN-9607).
  - Fixed an issue where the SoftDevice HardFault handler could hang if the application wrote to protected memory (DRGN-9694).

- Fixed an issue where the HFXO would sometimes not be released properly after RC calibration. This is in addition to the bug fix for a similar condition resolved in s112\_nrf52\_6.0.0 (DRGN-9920, DRGN-10166).
- Fixed an issue where the PA/LNA GPIOs could be triggered too late. Furthermore, the PA pin is now set active 23  $\mu$ s before RADIO TX start, instead of 5  $\mu$ s before RADIO TX start. The LNA pin is set active 5  $\mu$ s before RADIO RX start, as before (DRGN-9928).
- Fixed documentation for `SD_EVT_IRQHandler` and `RADIO_NOTIFICATION_IRQHandler`, where the default interrupt priority was documented incorrectly (DRGN-10174).
- Fixed an issue where LFRC oscillator calibration could fail (DRGN-10255).
- Fixed an issue that could make the SoftDevice assert when scheduling events close together (DRGN-10316).
- GAP
  - Fixed an issue where the advertiser would not update its address type if `sd_ble_gap_addr_set()` or `sd_ble_gap_privacy_set()` was called after `sd_ble_gap_adv_set_configure()` and before `sd_ble_gap_adv_start()` (DRGN-10025).
  - Fixed an issue that could cause an assert when an advertiser configured with invalid parameters connected to a peer (DRGN-10355).
  - Fixed an issue that could cause an assert when the advertiser was stopped (DRGN-10364).
- LL
  - Fixed an issue that could cause links to disconnect (DRGN-9844).
  - Fixed an issue where the slave might not listen during the entire connection parameter update (DRGN-10086).

## Limitations

- SoftDevice
  - If Radio Notifications are enabled, flash write and flash erase operations initiated through the SoftDevice API will be notified to the application as Radio Events (FORT-809).
  - Synthesized low frequency clock source is not tested or intended for use with the BLE stack.
  - Applications must not modify the `SEVONPEND` flag in the `SCR` register when running in priority levels higher than 6 (priority level numerical values lower than 6) as this can lead to undefined behavior.
- GATT
  - To conform to the Bluetooth Core Specification v 5.0, there shall be no secondary service that is not referenced somehow by a primary service. The SoftDevice does not enforce this (DRGN-906).

## Known Issues

- SoftDevice
  - `sd_ble_gap_device_name_set()` may return `NRF_ERROR_INTERNAL` instead of `NRF_ERROR_NO_MEM` if the allocated space for the device name is too small. A workaround is to allocate large enough space for the device name before calling `sd_ble_gap_device_name_set()` (DRGN-10195).
  - If the application requests an earliest possible Radio Timeslot and the timeslot is blocked, the SoftDevice will repeat the same request until it times out, thereby blocking the main context and the lower application interrupt priority levels. A possible workaround is to increase the timeout of the Radio Timeslot request to make it able to fit after the event that is blocking the request (DRGN-10402).

## s112\_nrf52\_6.0.0

The main new feature of s112\_nrf52\_6.0.0 compared to s112\_nrf52810\_5.1.0 is channel information in the Received Signal Strength Indication (RSSI) reports.

Notes:

- This release has changed the Application Programmer Interface (API). This requires applications to be recompiled.
- The memory requirements of the S112 SoftDevice have changed.
- The release notes list changes since s112\_nrf52810\_5.1.0.
- The SoftDevice release naming convention has changed: Instead of specifying the platform supported by the SoftDevice in the release name, the release notes will have this information.

## SoftDevice properties

- This SoftDevice variant is production tested for nRF52810. It can be used on nRF52832 for development purposes.
- This version of the SoftDevice contains the Master Boot Record (MBR) version 2.2.2 (DRGN-9537).
- The combined MBR and SoftDevice memory requirements for this version are as follows:
  - Flash: **100.0 kB** (0x19000 bytes).
  - RAM: **3.86 kB** (0xF70 bytes). This is the minimum required memory. The actual requirements depend on the configuration chosen at `sd_ble_enable()` time.
- The Firmware ID of this SoftDevice is 0x00A7.

## New functionality

- SoftDevice
  - The SoftDevice API for advertising and scanning is updated and prepared to support future features. For more information, see the migration document (DRGN-9712).
- GAP
  - Channel number for RSSI measurement is now available in advertising reports (DRGN-9473).
  - Channel number for RSSI measurement is now available for connections (DRGN-9667).
  - The SoftDevice now supports the configuration of TX power per link and per role (DRGN-6659).

## Changes

- SoftDevice
  - The SoftDevice now returns `NRF_ERROR_BUSY` from flash API functions until the event generated after a previous flash operation has been pulled (DRGN-9565).
  - The SoftDevice now has an additional API for write-protecting memory. This can now be achieved by accessing the BPROT peripheral configuration registers through `sd_protected_register_write()` (DRGN-9337).
  - A message sequence chart for Unexpected Security Packet Reception has been added to Peripheral Security Procedures in the API documentation (DRGN-9479).
- GATT
  - The SoftDevice will now return `NRF_ERROR_TIMEOUT` instead of `NRF_ERROR_BUSY` from GATT API functions if a GATT procedure is blocked due to a previous procedure timeout (DRGN-9545).
  - Clarified API documentation: The length field in the parameter struct passed to `sd_ble_gatts_hvx()` may be written to by the SoftDevice (DRGN-9620).
- LL
  - The documentation of the PHY Update procedure is improved (DRGN-9678).
  - Bluetooth Core Specification Erratum #7408 is incorporated, meaning that it is now accepted to receive an `LL_UNKNOWN_RSP` during encryption procedure (DRGN-8414).

## Bug fixes

- SoftDevice
  - Fixed an issue where `sd_ble_gap_rssi_get()` could sometimes return `NRF_ERROR_SUCCESS` with an invalid RSSI (DRGN-9746).
  - Fixed an issue where the HFXO would sometimes not be released properly after RC calibration (DRGN-9920).
- GATT

- Fixed an issue where the SoftDevice could drop a write request if it was received at the same time as a write command (DRGN-9709).
- LL
  - Fixed an issue where the slave could disconnect with status code `BLE_HCI_DIFFERENT_TRANSACTION_COLLISION` if master sent an `LL_UNKNOWN_RSP` after a PHY procedure collision (DRGN-9870).
  - Fixed an issue where the SoftDevice might advertise with the RxAdd bit set to 1 for undirected advertisements. According to the Bluetooth Core Specification v 5.0, the RxAdd bit is reserved for future use for these PDU types (DRGN-9739).
  - Fixed an issue where the SoftDevice could assert if the identity list was used while advertising (DRGN-9723).

## Limitations

- SoftDevice
  - If Radio Notifications are enabled, flash write and flash erase operations initiated through the SoftDevice API will be notified to the application as Radio Events (FORT-809).
  - Synthesized low frequency clock source is not tested or intended for use with the BLE stack.
  - Applications must not modify the `SEVONPEND` flag in the `SCR` register when running in priority levels higher than 6 (priority level numerical values lower than 6) as this can lead to undefined behavior.
- GATTS
  - To conform to the Bluetooth Core Specification v 5.0, there shall be no secondary service that is not referenced somehow by a primary service. The SoftDevice does not enforce this (DRGN-906).

## Known Issues

- SoftDevice
  - If the application calls a NULL pointer, there will be a HardFault inside the SoftDevice HardFault handler (DRGN-9607).
  - If `sd_ble_gap_addr_set()` or `sd_ble_gap_privacy_set()` is called after `sd_ble_gap_adv_set_configure()` and before `sd_ble_gap_adv_start()`, the advertiser will not update its address type (DRGN-10025).

## s112\_nrf52810\_5.1.0

This release is the first production version of the S112. The S112 is a size-optimized peripheral-only BLE SoftDevice for Nordic Semiconductor's nRF52810 chip. The S112 API is a compatible subset of the S132 SoftDevice API. For features that are common to S112 and S132, the API is the same. To show the API compatibility, the S112 follows the same version numbering as S132.

The main change relative to the s112\_nrf52810\_5.1.0-2.alpha is that the observer role functionality is removed from the SoftDevice. The SoftDevice also has some minor updates and bug fixes.

Notes:

- The priority of SoftDevice interrupts SD\_EVT\_IRQn (SWI2\_IRQn) and RADIO\_NOTIFICATION\_IRQn (SWI3\_IRQn) is 6. This is different from S132 4.x and previous SoftDevices (DRGN-9245).

## SoftDevice properties

- The S112 SoftDevice Specification document will be available at <http://infocenter.nordicsemi.com/>.
- This version of the SoftDevice contains the Master Boot Record (MBR) version 2.2.2 (DRGN-9537).
- The combined MBR and SoftDevice memory requirements for this version are as follows:
  - **Flash: 96 kB** (0x18000 bytes).
  - **RAM: 3.68 kB** (0xeb8 bytes). This is the minimum required memory. The actual requirements depend on the configuration chosen at `sd_ble_enable()` time.

## Device Compatibility

The SoftDevice is built, production tested, and qualified for use with nRF52810.

The SoftDevice is not production tested and qualified for use with nRF52832. However, the SoftDevice can be used for development purposes on the nRF52832 if minor performance and stability issues are accepted during development.

## New functionality

This release has no new features compared to the s112\_nrf52810\_5.1.0-2.alpha.

## Changes

Relative to the s112\_nrf52810\_5.1.0-2.alpha:

- GAP
  - Observer role is no longer supported, and the following functions, structures, defines, and events have been removed (DRGN-9298):
    - `BLE_GAP_EVT_ADV_REPORT`
    - `BLE_GAP_TIMEOUT_SRC_SCAN`
    - `BLE_GAP_SCAN_INTERVAL_MIN`, `BLE_GAP_SCAN_INTERVAL_MAX`
    - `BLE_GAP_SCAN_WINDOW_MIN`, `BLE_GAP_SCAN_WINDOW_MAX`
    - `BLE_GAP_SCAN_TIMEOUT_MIN`, `BLE_GAP_SCAN_TIMEOUT_MAX`
    - `ble_gap_scan_params_t`
    - `ble_gap_evt_adv_report_t`
    - `sd_ble_gap_scan_start()`
    - `sd_ble_gap_scan_stop()`
- LL
  - The SoftDevice now sends `LL_REJECT_EXT_IND` instead of `LL_REJECT_IND` if the peer has indicated support for `LL_REJECT_EXT_IND` (DRGN-9539).

Relative to the s132\_nrf52\_5.0.0:

- SoftDevice

- `sd_flash_protect()` will now return `NRF_ERROR_NOT_SUPPORTED` if a non-zero value is given for a BPROT configuration register that is not available on the platform (DRGN-9336). (This was also part of the s112\_nrf52810\_5.1.0-2.alpha release.)
- References to `EGU*` have been removed from `nrf_soc.h` and `nrf_nvic.h` as the SoftDevice is using SWI and not EGU to generate interrupts (DRGN-9257). (This was also part of the s112\_nrf52810\_5.1.0-2.alpha release.)

See the release notes for the s112\_nrf52810\_5.1.0-2.alpha for the rest of the changes.

## Bug fixes

Compared to the s112\_nrf52810\_5.1.0-2.alpha, the following bugs have been fixed:

- SoftDevice
  - Fixed an issue where `sd_ble_gatts_attr_get()` and `sd_ble_gatts_value_get()` could return undocumented `BLE_ERROR_INVALID_ATTR_HANDLE` error code in a situation where they should have returned `NRF_ERROR_NOT_FOUND` (DRGN-9216).
  - Fixed an issue where the API documentation was referencing removed APIs (DRGN-9484).
  - Fixed an issue where some include directives were missing in `ble_gatts.h` (DRGN-9467).
- GATT
  - Fixed an issue where the SoftDevice could assert if ATT packets longer than the LL packet size were sent and received at the same time (DRGN-9328).
- LL
  - Fixed an issue where the SoftDevice could assert while doing radio or flash activity (DRGN-9463).
  - Fixed an issue where the SoftDevice could send `LL_FEATURE_RSP` with incorrect `FeatureSet` (DRGN-9551).
  - Fixed an issue where the slave disconnect event reason code was set to `HCI_LOCAL_HOST_TERMINATED_CONNECTION` instead of `HCI_STATUS_CODE_PIN_OR_KEY_MISSING`. This occurred if the LTK (Long Term Key) was missing during the re-encryption of the link (DRGN-9190). (This was also fixed in the s112\_nrf52810\_5.1.0-2.alpha release.)

## Limitations

- SoftDevice
  - If Radio Notifications are enabled, flash write and flash erase operations initiated through the SoftDevice API will be notified to the application as Radio Events (FORT-809).
  - Synthesized low frequency clock source is not tested or intended for use with the BLE stack.
  - Applications must not modify the `SEVONPEND` flag in the `SCR` register when running in priority levels higher than 6 (priority level numerical values lower than 6) as this can lead to undefined behavior.
- GATTS
  - To conform to the Bluetooth Core Specification v 5.0, there shall be no secondary service that is not referenced somehow by a primary service. The SoftDevice does not enforce this (DRGN-906).

## Known Issues

- GAP
  - The SoftDevice can assert if the whitelist and identity list is set at the same time with matching addresses. A workaround for this issue is to clear the whitelist before setting the identity list (DRGN-9535).

# s112\_nrf52810\_5.1.0-2.alpha

The S112 is a size-optimized peripheral only BLE SoftDevice for Nordic Semiconductor's nRF52810 chip. The S112 API is a compatible subset of the S132 SoftDevice API. For features that are common to S112 and S132, the API is the same. To show the API compatibility, the S112 follows the same version numbering as S132. See the section "Changes" below for features that are not available in the S112 compared to the S132.

## SoftDevice properties

- The combined MBR and SoftDevice memory requirements for this version are as follows:
  - Flash: **100 kB** (0x19000 bytes)
  - RAM: **3.65 kB** (0xe98 bytes)

## Device Compatibility

This SoftDevice is built and tested for nRF52810.

For development purposes this SoftDevice can be run on the nRF52832, but some of the Errata workarounds for that device are not present in this version of the alpha SoftDevice. This may result in minor performance and stability issues on nRF52832.

## New functionality

This release is the first version of the S112. It is based upon the s132\_nrf52\_5.0.0, and has no new functionality compared to that version.

## Changes

Compared to the s132\_nrf52\_5.0.0, the following features have been removed:

- SoftDevice:
  - MWU is not supported, as the nrf52810 does not have MWU (DRGN-9341).
  - Cache is not supported, as the nrf52810 does not have Cache (DRGN-9256).
- GAP:
  - Observer role is still present in this alpha version of the SoftDevice, but might be removed for the production version.
  - Central Role is no longer supported and the following functions, structures, defines and events have been removed (DRGN-9145):
    - `sd_ble_gap_connect()` , `sd_ble_gap_connect_cancel()`
    - `sd_ble_gap_encrypt()`
    - `BLE_GAP_EVT_CONN_PARAM_UPDATE_REQUEST`
    - `ble_gap_evt_conn_param_update_request_t`
    - `BLE_GAP_OPT_COMPAT_MODE_1`
    - `ble_gap_opt_compat_mode_1_t`
    - `BLE_GAP_ROLE_CENTRAL` , `BLE_GAP_ROLE_COUNT_CENTRAL_DEFAULT` , `BLE_GAP_ROLE_COUNT_CENTRAL_SEC_DEFAULT`
  - LE Data Length Extension is no longer supported and the following structures, defines and events have been removed (DRGN-9242):
    - `sd_ble_gap_data_length_update()`
    - `BLE_GAP_EVT_DATA_LENGTH_UPDATE_REQUEST` , `BLE_GAP_EVT_DATA_LENGTH_UPDATE`
    - `BLE_GAP_DATA_LENGTH_AUTO`
    - `ble_gap_data_length_params_t` , `ble_gap_data_length_limitation_t`
    - `ble_gap_evt_data_length_update_request_t` , `ble_gap_evt_data_length_update_t`
- L2CAP:
  - L2CAP Connection Oriented Channels is no longer supported and the header file `ble_l2cap.h` with it's functions, structures, defines and events has been removed (DRGN-9238):
    - `sd_ble_l2cap_ch_setup()` , `sd_ble_l2cap_ch_release()` , `sd_ble_l2cap_ch_rx()` , `sd_ble_l2cap_ch_tx()` , `sd_ble_l2cap_ch_flow_control()`
    - `ble_l2cap_ch_rx_params_t` , `ble_l2cap_ch_setup_params_t` , `ble_l2cap_ch_tx_params_t` , `ble_l2cap_conn_cfg_t`
    - `BLE_L2CAP_EVT_CH_SETUP_REQUEST` , `BLE_L2CAP_EVT_CH_SETUP_REFUSED` , `BLE_L2CAP_EVT_CH_SETUP` , `BLE_L2CAP_EVT_CH_RELEASED` , `BLE_L2CAP_EVT_CH_SDU_BUF_RELEASED` , `BLE_L2CAP_EVT_CH_CREDIT` , `BLE_L2CAP_EVT_CH_RX` , `BLE_L2CAP_EVT_CH_TX`



- `ble_l2cap_evt_t`, `ble_l2cap_evt_ch_tx_t` , `ble_l2cap_evt_ch_rx_t` , `ble_l2cap_evt_ch_cred_it_t` , `ble_l2cap_evt_ch_sdu_buf_released_t` , `ble_l2cap_evt_ch_setup_request_t` , `ble_l2cap_evt_ch_setup_refused_t` , `ble_l2cap_evt_ch_setup_t`

## Bug fixes

Compared to the s132\_nrf52\_5.0.0, the following bugs have been fixed:

- SoftDevice
  - Fixed an issue where Radio Notification could be suppressed between connection events when Connection Event Length Extension was enabled (DRGN-7687).
- GAP
  - Fixed an issue where the SoftDevice could assert if the white list and identity list were set at the same time with matching addresses (DRGN-9535).

## Limitations

- SoftDevice
  - If Radio Notifications are enabled, flash write and flash erase operations initiated through the SoftDevice API will be notified to the application as Radio Events (FORT-809).
  - Synthesized low frequency clock source is not tested or intended for use with the BLE stack.
  - Applications must not modify the `SEVONPEND` flag in the `SCR` register when running in priority levels higher than 6 (priority level numerical values lower than 6) as this can lead to undefined behavior.
- GATTS
  - To conform to the Bluetooth Core Specification v 5.0, there shall be no secondary service that is not referenced somehow by a primary service. The SoftDevice does not enforce this (DRGN-906).

## Known Issues

No known issues.