CC2620 SimpleLink™ Zigbee® RF4CE Wireless MCU Silicon Revisions D, C, B, A

This document describes known exceptions to the functional specifications (advisories) for the CC2620 SimpleLink™ Zigbee® RF4CE wireless MCU.

Topic **Page**

1 Advisory Matrix

Table 1 lists all advisories, modules affected, and the applicable silicon revisions.

Table 1. Advisories Matrix

MODULE	DESCRIPTION	SILICON REVISIONS AFFECTED			
		D	C	B	A
OSC	Advisory 01, 32-kHz RC Oscillator (RCOSC_LF) Not Working		X	X	X
SSI	Advisory 02, Slave Mode Can Sample New TX Data From SYSBUS Clock Domain Using SSPCLK With No Synchronization	X	X	X	X
SSI	Advisory 03, Motorola® SPI Format Slave Mode Writes to Transmit FIFO Can Lose Data	X	X	X	X
System level	Advisory 04, Reading From Flash While Performing Clock Switching Between the High-Speed Oscillators (XOSC_HF and RCOSC_HF) Will Cause the System to Hang	X	X	X	X
Sensor Controller	Advisory 05, Insufficient Power Supply Recharging When Using the Sensor Controller Might Cause the System to Hang or Force a Pin Reset	X	X	X	X
PRCM	Advisory 06, Wrong Reset Source Indication	X	X	X	X
Receiver	Advisory 07, Temporary Loss of Receive Function During Continuous Receive Operation Over Long Time	X	X	X	X
System level	Advisory 08, Radio Frequency Error Glitch When Device Switches From IDLE to ACTIVE Mode While Radio is in TX or RX	X	X	X	X
System level	Advisory 09, Slow Transition Across Brown-Out Detect (BOD) Threshold Might Cause the Device to Hang	X	X	X	X

2 Nomenclature, Package Symbolization, and Revision Identification

2.1 Device and Development Support-Tool Nomenclature

To designate the stages in the product development cycle, Texas Instruments™ assigns prefixes to the part numbers of all devices and support tools. Each device has one of three prefixes: X, P, or null (for example, CC2620). Texas Instruments recommends two of three possible prefix designators for its support tools: TMDX and TMDS. These prefixes represent evolutionary stages of product development from engineering prototypes (X/TMDX) through fully qualified production devices/tools (null/TMDS).

Device development evolutionary flow:

X— Experimental device that is not necessarily representative of the final device's electrical specifications and may not use production assembly flow.

P— Prototype device that is not necessarily the final silicon die and may not necessarily meet final electrical specifications.

null— Production version of the silicon die that is fully qualified.

Support tool development evolutionary flow:

TMDX— Development-support product that has not yet completed Texas Instruments internal qualification testing.

TMDS— Fully-qualified development-support product.

X and P devices and TMDX development-support tools are shipped against the following disclaimer:

"Developmental product is intended for internal evaluation purposes."

Production devices and TMDS development-support tools have been characterized fully, and the quality and reliability of the device have been demonstrated fully. TI's standard warranty applies.

Predictions show that prototype devices (X or P) have a greater failure rate than the standard production devices. Texas Instruments recommends that these devices not be used in any production system because their expected end-use failure rate still is undefined. Only qualified production devices are to be used.

2.2 Devices Supported

This document supports the CC2620 device.

There are four revisions of the CC2620 device: revision A, revision B, revision C, and revision D. Revision D is the latest silicon revision. Only CC2620 revision D has been manufactured since February 2015.

2.3 Package Symbolization and Revision Identification

Figure 1 and Table 2 describe package symbolization and device revision codes.

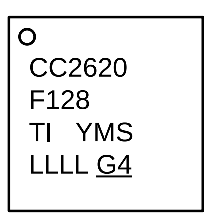

Figure 1. Package Symbolization

Table 2. Revision Identification

DEVICE REVISION CODE	SILICON REVISION
A	2.0
B	2.1
C	2.2
D	2.3

3 Silicon Revision D Advisories

This section lists the advisories for this silicon revision.

Table 3. Silicon Revision D Advisory List

Advisory 02 *Slave Mode Can Sample New TX Data From SYSBUS Clock Domain Using SSPCLK With No Synchronization*

Revision(s) Affected: A, B, C, and D

Details: When the SSI is programmed to operate in slave mode, the data written to the SSI data register (SSIn:DR) in the SYSBUS clock domain can be sampled in the SSPCLK domain or without any synchronization. This sampling condition occurs when all of the following conditions are met:

- The SSI Transmit FIFO is empty.
- The SSI Data register (SSIn:DR) write access occurs as a new SPI master transfer starts.
- The SSI slave-state machine samples data to transmit.

This issue causes written data to be lost.

Workaround(s): Use TI's Unified Network Processor Interface (NPI).

Advisory 03 — *Motorola® SPI Format Slave Mode Writes to Transmit FIFO Can Lose Data*

Revision(s) Affected: A, B, C, and D

Details: If the SSI is configured to operate in Motorola® SPI format slave mode, loss of write data can occur when the following two conditions are met:

1. A write to the SSI data register (SSIn:DR) occurs between a new SPI master transfer starting and the end of the first bit of incoming data.
2. A write to the SSI data register (SSIn:DR) occurs during the first bit of new incoming data in a back-to-back transfer sequence.

For more details, see the Synchronous Serial Interface (SSI) chapter in the *CC13x0, CC26x0 SimpleLink™ Wireless MCU Technical Reference Manual*.

Workaround(s): Use TI's Unified Network Processor Interface (NPI).

Advisory 04 — *Reading From Flash While Performing Clock Switching Between the High-Speed Oscillators (XOSC_HF and RCOSC_HF) Will Cause the System to Hang*

Revision(s) Affected: A, B, C, and D

Details: The CC2620 device contains five modules that can read from flash independently of each other. These five modules are:

- Arm® Cortex®-M3
- RF Core
- I2S
- µDMA
- Crypto (AES module)

Clock switching between XOSC_HF and RCOSC_HF can only be initiated by the Cortex-M3. While the Cortex-M3 performs clock switching, no other modules are allowed to read from the flash. The system will hang if any of the other four modules (RF core, I2S, µDMA, or Crypto) are reading from flash during this period.

Workaround(s): The user must make sure that the Cortex-M3 does not perform clock switching while any of the other four modules (RF core, I2S, µDMA, or Crypto) are reading from flash.

SimpleLink SDK (TI-RTOS)

Clock switching from RCOSC_HF to XOSC_HF is done by calling Power_setDependency (XOSC_HF). The user must register a notification to be notified when the clock switching is completed. When the notification function is called by the power driver, the clock switching is completed and it is safe for all modules to read from flash again.

Clock switching from XOSC_HF to RCOSC_HF is done by calling Power_releaseDependency (XOSC_HF). When this function returns, the clock switching is completed and it is safe for all modules to read from flash again. The TI-RTOS radio driver never reads from flash, so it is safe to perform clock switching at all times when using this driver. However, it is up to the user to make sure that no clock switching is performed if the RF Core, I2S, µDMA, or Crypto modules are reading from flash.

No RTOS

Clock switching is performed by calling the driverLib API OSCHfSourceSwitch(). When this function returns, it is safe for all modules to read from flash again. It is up to the user to make sure that no clock switching is performed if the RF core, I2S, µDMA, or Crypto modules are read from flash.

Advisory 05 — *Insufficient Power Supply Recharging When Using the Sensor Controller Might Cause the System to Hang or Force a Pin Reset*

Revision(s) Affected: A, B, C, and D

Details: When the CC2620 device goes into standby, a time interval must be set for the initial period between VDDR recharges based on temperature and certain device-specific trims. However, if the Sensor Controller wakes up and puts the device back into standby without waking the CM3, the initial recharge period programmed by the CM3 will be used again by the hardware. If the temperature has increased sufficiently between the time the CM3 puts the device into standby and the time the Sensor Controller puts the device into standby, the recharge period programmed may be too long. VDDR may drop below the permitted minimum threshold due to the temperature induced increased leakage. This may cause an inconsistent internal state in the device or cause the device to hang, forcing a pin reset.

Workaround(s): If the device is put in standby while using the Sensor Controller, the user must ensure that the initial recharge period programmed by the CM3 is more conservative than what is strictly necessary at the current temperature. The longest duration that the CM3 sleeps at a specific temperature gradient, defines a maximum limit for temperature increase between recalculations of the initial recharge period. The sleep duration can be altered such that a decrease in the converged recharge period matches the margin subtracted from the initial recharge period.

The following parameters are needed for the workaround:

- The user's maximum expected temperature gradient in °C/s
- The upper bound of the user's expected operating temperature range in °C
- The initial recharge period set at the upper bound of the user's expected operating temperature range in SCLK_LF clock periods
- A table of converged recharge periods in SCLK_LF clock periods at varying temperatures decreasing from the upper bound of the user's expected operating temperature
- The margin in SCLK_LF clock periods that the user wants to subtract from the regular initial recharge period. The higher this value, the longer the device can sleep before requiring a wakeup to recalculate the initial recharge period. However, higher values will lead to slower convergence of the recharge algorithm towards the ideal recharge period at a given temperature.

Based on the parameters above, the user can make the following calculations to determine the maximum duration the CM3 can sleep before waking up to recalculate the initial recharge period:

- Add the margin to the converged recharge period at the upper bound of your operating temperature.
- Find the value in the table of converged recharge periods that comes closest to this value and determine the temperature this value occurs at.
- Find the temperature difference between that temperature and the upper bound of your expected operating temperature range.
- Divide this temperature delta by your maximum expected temperature gradient.

The result of the calculations above is a time value in seconds. This value is the longest time the device can safely stay in standby before a CM3 wakeup must be forced if the Sensor Controller is active.

Advisory 06 — *Wrong Reset Source Indication*

Revision(s) Affected: A, B, C, and D

Details: The field RESET_SRC in the register AON_SYSCTL:RESETCTL shows the source of the last system reset. Occurrence of one of the reset sources may trigger several other reset sources as essential parts of the system are undergoing a reset. This field will report the source of the reset (not the other resets that are consequence of the system reset). To support this feature, the actual register is not captured before the reset source is released. If a new reset source is triggered within a window of four 32-kHz periods after the previous reset source was released, the register field RESET_SRC may indicate power-on reset as source regardless of the actual reset source.

Workaround(s): None

Advisory 07 — *Temporary Loss of Receive Function During Continuous Receive Operation Over Long Time*

Revision(s) Affected: A, B, C, and D

Details: The CC2620 IEEE 802.15.4 modem has a mismatch in the data rates between two modules. If a CC2620 device operates in continuous receive mode over a long period of time without receiving any frames (including frames that are rejected by MAC filtering), the mismatch will cause a temporary loss of proper RF reception on some RF frequencies. The first time of such a temporary loss depends on operating frequency. The problem will not occur on IEEE 802.15.4 channels 13, 16, 19, 22, or 25. For the IEEE 802.15.4 channels 12, 15, 18, 21, and 24, the issue will not occur earlier than 1.4 seconds after start of the receiver. On channels 11, 14, 17, 20, 23, and 26, the issue will not occur earlier than 0.9 seconds after the start of the receiver.

Workaround(s): Use IEEE 802.15.4 channels 13, 16, 19, 22, or 25.

Advisory 08 — *Radio Frequency Error Glitch When Device Switches From IDLE to ACTIVE Mode While Radio is in TX or RX*

Revision(s) Affected: A, B, C, and D

Details: If the device switches from IDLE to ACTIVE mode (for example, if the CPU starts executing code) while the radio is transmitting or receiving, it can result in a frequency deviation error in the modulated signal or erroneous signal reception.

Workaround(s): Keep the flash ON in IDLE by using the TI Power driver API:
Power_setConstraint(PowerCC26XX_NEED_FLASH_IN_IDLE)

Advisory 09 — *Slow Transition Across Brown-Out Detect (BOD) Threshold Might Cause the Device to Hang*

Revision(s) Affected: A, B, C, and D

Details: For applications using non-rechargeable (primary) battery, the issue described in this advisory would potentially occur only at end-of-life of the battery, and therefore a workaround is not necessary as the battery would anyway need to be replaced, triggering a power-on reset.

If the VDDS supply voltage is held in the BOD threshold region (approximately 1.78 V), the device might on rare occasions end up in a lock-up state. The current draw is approximately 2.25 mA in this state. The device will not exit this state by increasing the VDDS supply voltage above the BOD threshold. To get out of this state, a pin reset must be performed or the VDDS supply voltage must be decreased below the power-on reset (POR) threshold (1.0 V), triggering a POR reset.

The lock-up state is triggered if a brown-out-detect (BOD) event occurs during specific stages of the boot code execution. There are two critical, narrow time windows, each of approximately 10 ns duration, and both of these time windows occur within 100 µs to 1 ms after the reset event that started the boot code execution. Typically, this can happen when the supply voltage is ramped slowly across the BOD threshold. Supply resistance, in combination with device startup current will then pull the VDDS supply voltage below the BOD threshold multiple times as the device turns on and off due to resets.

For Li-Ion and NiMH rechargeable batteries, a first level protection disconnecting the chip VDDS supply would typically prevent the device from entering this state during battery discharge as the device power supply would fall below the POR threshold.

Workaround(s): The following workarounds must be implemented:

The specified operating supply voltage range for the device is 1.8 V to 3.8 V. When using rechargeable batteries, the battery protection system must ensure that either:

- The device supply voltage remains at or above the minimum operating supply voltage (1.8 V) once powered on, or
- If the device supply is discharged below the minimum operating supply voltage (1.8 V), the device must be reset (pin or power-on reset) when the supply is charged above the minimum operating supply voltage (1.8 V) again.

4 Silicon Revision A, B, and C Advisories

This section lists the advisories for silicon revisions A, B, and C.

Silicon revision-applicable advisories have been found on a later silicon revision. For more details, see Silicon Revision D Advisories.

Table 4. Silicon Revision A, B, and C Advisory List

Advisory 01 — *32-kHz RC Oscillator (RCOSC_LF) Not Working*

Revision(s) Affected: A, B, and C

Details: RCOSC_LF (32.768 kHz) may occasionally produce glitches. The most common symptom when using RCOSC_LF as the low-frequency clock source is that the RTC is advanced or delayed by one SCLK_LF period. However, there may be other consequences, such as system lock-up, potentially leading to an erroneous digital state and unpredicted behavior.

Workaround(s): The user ***must*** use XOSC_LF as the low-frequency clock source (32.768-kHz crystal is required).

For more details, see the *CC13x0, CC26x0 SimpleLink™ Wireless MCU Technical Reference Manual*.

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Revision History

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