THE DATASHEET OF

C8051F412-GQ

April 4, 2013

C8051F41x Revisions A-F Errata

Hardware Errata

Erratum #	Title	Impact	Status	
			Affected Revisions	Fixed Revision
H1	XTLVLD is Incorrect	Minor	Revisions A-F	Not Fixed
H2	Port Pin Overvoltage	Minor	Revision E only	Fixed in Revision F
H3	Clock Glitch During the Clock Multiplier Initialization Sequence	Minor	Revisions A-F	Not Fixed

Impact Definition: Each erratum is marked with an impact, as defined below:

- Minor—Workaround exists.
- Major—Errata that do not conform to the data sheet or standard.
- Information—The device behavior is not ideal but acceptable. Typically, the data sheet will be changed to match the device behavior.

Hardware Errata Details

H1. **XTLVLD is Incorrect**

Description: The XTLVLD bit in the OSCXCN register may not properly indicate when an external crystal oscillator is running and stable. The XTLVLD bit may read as 0, even if the crystal is properly oscillating.

Impact: The recommended procedure in the data sheet for using an external oscillator as the system clock includes a step to poll the XTLVLD bit. Since the XTLVLD bit may not correctly indicate the status of the external crystal, this procedure is no longer valid.

Workaround: The firmware can determine if the external oscillator is running by using the external oscillator as the clock source for the PCA or one of the four timers. Once enabled, if the PCA or timer counter counts the expected number of cycles over a fixed period of time, the firmware can safely switch to the external oscillator as the system clock. Using the external oscillator as the clock source for a PCA or timer does not require switching to the crystal oscillator as the main system clock. Once the crystal oscillator is selected as the system clock, the PCA or timer no longer needs to be used for this purpose.

The updated procedure for using a crystal oscillator as the system clock is provided below. Contact mcuapps@silabs.com for example code that implements this procedure.

Step 1 Force the XTAL1 and XTAL2 pins low by writing 0s to the port latch.
Step 2 Configure XTAL1 and XTAL2 as analog inputs.
Step 3 Release the crystal pins by writing 1s to the port latch.
Step 4 Enable the external oscillator.
Step 5 Wait at least 1 ms.
Step 6 Configure the PCA or a timer to use the external oscillator as the clock source.
Step 7 Monitor the PCA or timer over a fixed period of system clock cycles to ensure the external oscillator is oscillating at the correct speed.
Step 8 Enable the Missing Clock Detector as a Reset Source.

Step 9 Switch the system clock to the external oscillator.

H2. **Port Pin Overvoltage**

Description: Port pins that are programmed for push-pull output mode and a logic-high state (1 written to the port pin latch) may become forced to a logic-low state if exposed to an overvoltage condition that exceeds the specified limits as posted in the data sheet (see "Absolute Maximum Specifications").

Impact: This can result in up to 40 mA of current consumption (per pin affected) from the on-chip voltage supply, or higher than expected current consumption from an off-chip source connected to the pin due to the low impedance path to ground. Revision F will fix this problem.

Workaround: Standard system level design practices to ensure port pins are protected from over voltage conditions (i.e., conditions outside the specified limits in the data sheet) should be implemented, such as in-series resistors (e.g., 100 Ω in-series resistor) and/or schottky protection diodes to prevent over voltage conditions (e.g., BAT54S) for pins that are considered high risk (e.g., pins connected to signals that are exposed to human contact off-board).

H3. **Clock Glitch During the Clock Multiplier Initialization Sequence**

Description: The action of enabling the ADC (setting the AD0EN bit in ADC0CN to a 1) or enabling the ADC bias generator (setting the ZTCEN bit in REF0CN to a "1") can cause temporary frequency instability in the Clock Multiplier output. The clocks produced during this period of instability may violate the maximum frequency specification for the system clock, resulting in undefined CPU operation if the Clock Multiplier is selected as the system clock source during this time. The duration of the instability is approximately 1500 ns.

Impact: The clocks produced during this period of instability may violate the maximum frequency specification for the system clock, resulting in undefined CPU operation if the Clock Multiplier is selected as the system clock source during this time. The duration of the instability is approximately 1500 ns.

Workaround: To avoid this period of undefined CPU operation:
1) Operate from a system clock source other than the Clock Multiplier when enabling the ADC and wait to switch the system clock to use the Clock Multiplier for at least 10 µs, OR
2) Operate from a system clock source other than the Clock Multiplier when enabling the bias generator to the ADC (by setting ZTCEN in the REF0CN register to a '1') and wait to switch the system clock to use the Clock Multiplier for at least 10 µs.

The sequence can be completed once during the initialization process, and the ADC bias generator consumes approximately 50 µA when enabled.

The action of enabling the ADC (by setting the AD0EN bit in ADC0CN to a 1) while the ADC's bias generator is already enabled has no undesirable effects on the Clock Multiplier output. The action of disabling the ADC (by clearing the AD0EN bit in ADC0CN to a 0) has no undesirable effects on the Clock Multiplier output. The action of disabling the ADC's bias generator (by clearing the ZTCEN bit in REF0CN to a 0) has no undesirable effects on the Clock Multiplier output.

Documentation Errata

The Documentation Errata is applicable to the following documents:

- C8051F41x Data Sheet Revision 1.1

Erratum #	Title	Impact
D1	Temperature Sensor Accuracy	Information

Impact Definition: Each erratum is marked with an impact, as defined below:

- Minor—Workaround exists.
- Major—Errata that do not conform to the data sheet or standard.
- Information—The device behavior is not ideal but acceptable. Typically, the data sheet will be changed to match the device behavior.

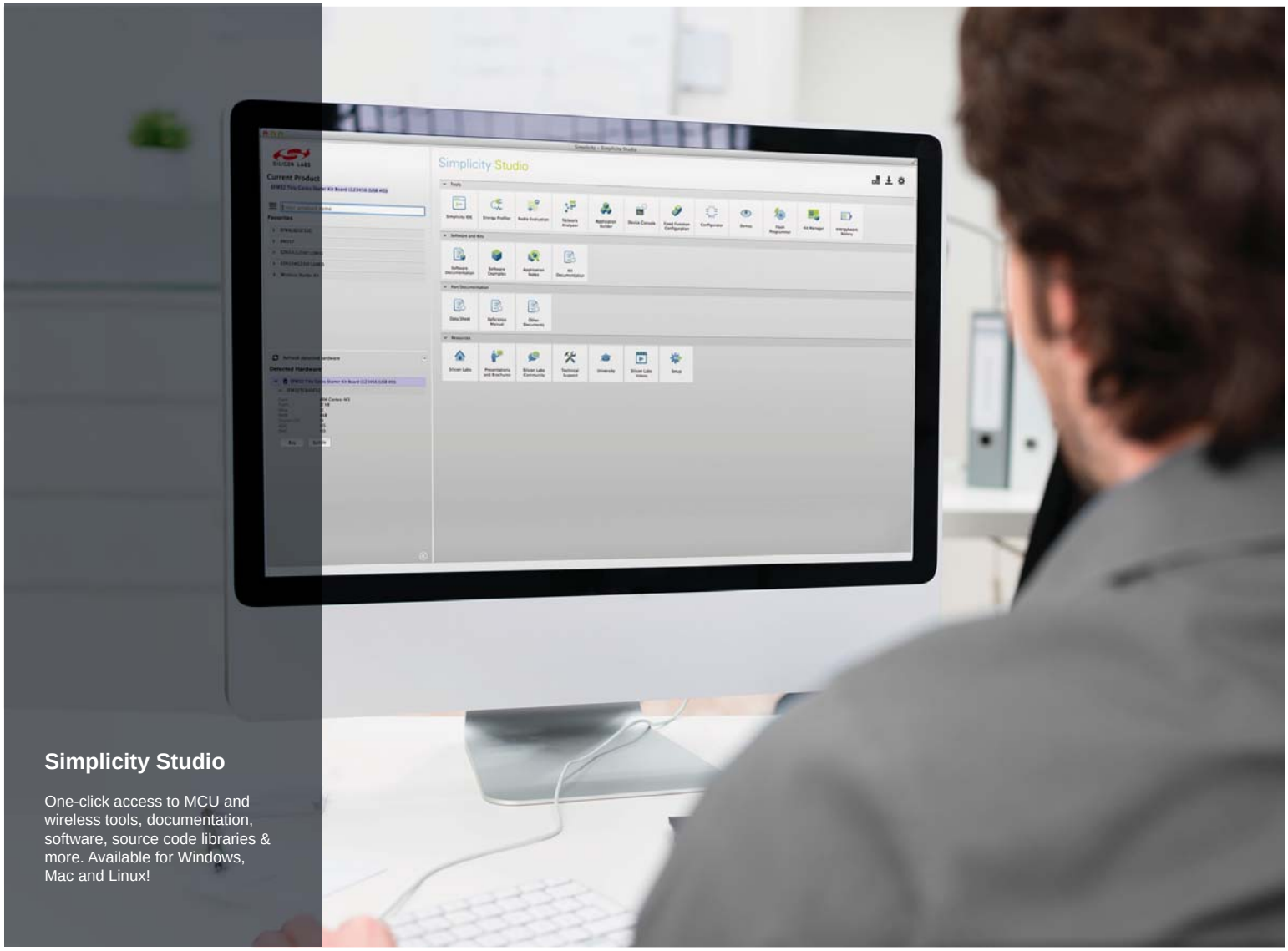
Documentation Errata Details

D1. **Temperature Sensor Accuracy**

Description: The current version of the data sheet (Revision 1.1) lists the accuracy of the temperature sensor as ±3 °C on the first page. This accuracy is only available if firmware performs a one-point calibration of the temperature sensor. Without the one-point calibration, the estimated accuracy of the temperature sensor is ±10 °C. The next revision of the datasheet will be updated to include this information.

Impact: Systems expecting the uncalibrated temperature sensor to perform with ±3 °C of accuracy without calibration will not see this accuracy.

Workaround: Systems requiring ±3 °C of accuracy from the temperature sensor should perform a one-point calibration of the temperature sensor. This will ensure the accuracy of the temperature sensor is within this range.



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