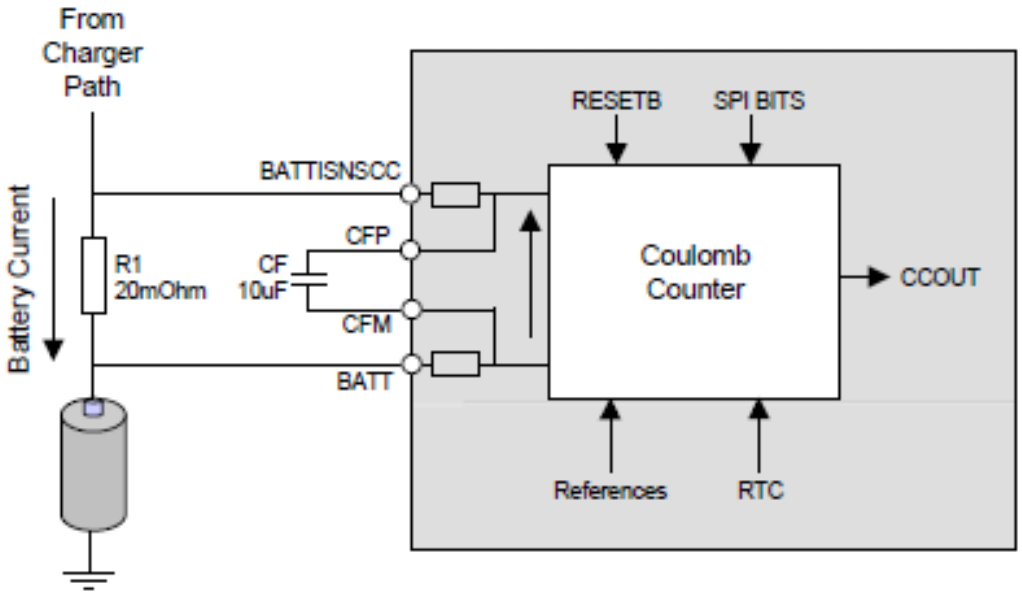
Coulomb Counter Functionality on MC13892

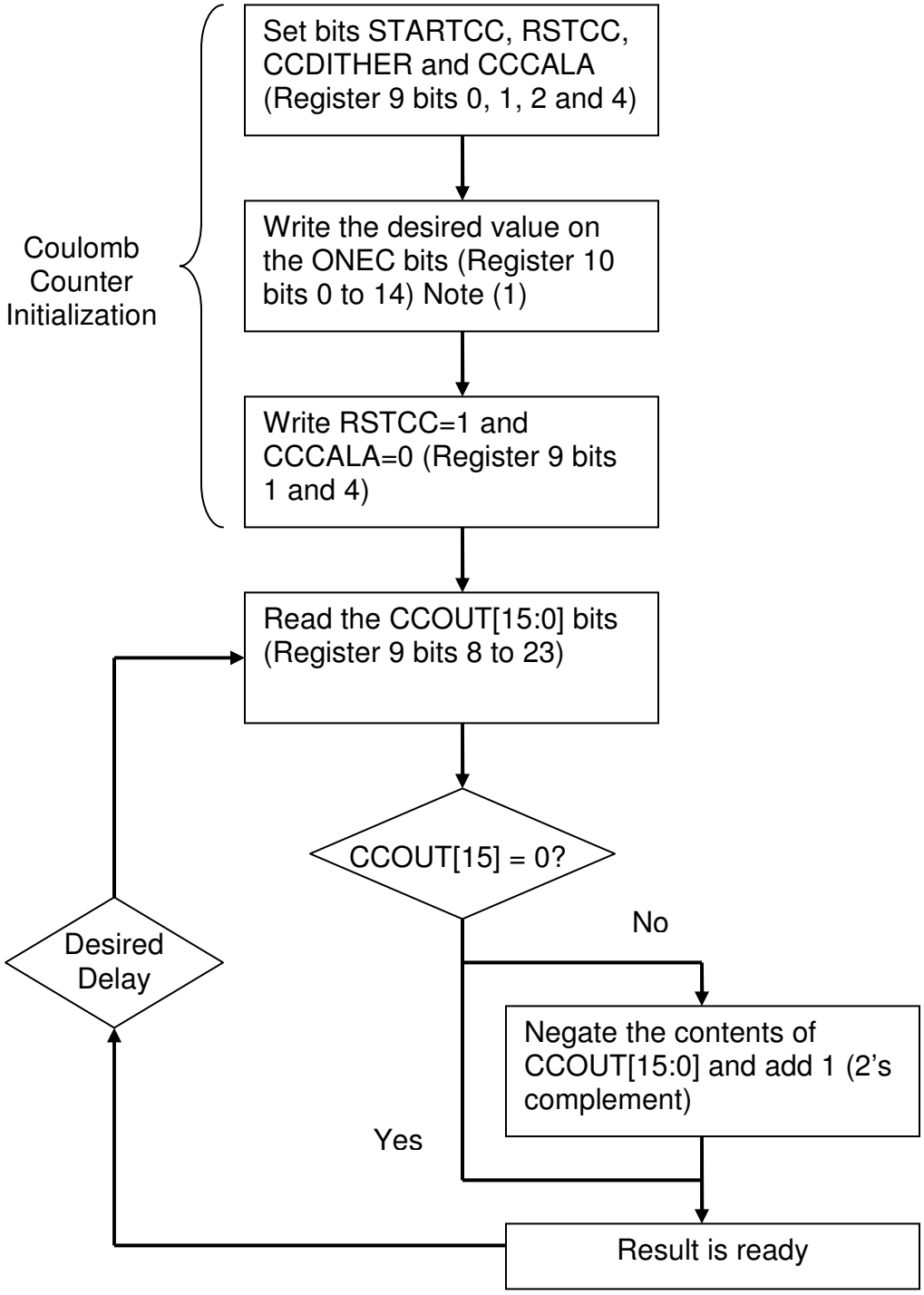
General Information

The Coulomb Counter (or CC) monitors the current flowing in/out of the battery by integrating the voltage drop across the battery current sense resistor R1, followed by an A to D conversion. The result of the A to D conversion is used to increase/decrease the contents of a counter that can be read out by software. This function will require a 10uF output capacitor to perform a first order filtering of the signal across R1. Due to the sampling of the A to D converter and the filtering applied, the longer the software waits before retrieving the information from the CC, the higher the accuracy. The capacitor will be connected between the pins CFP and CFM, see diagram below.



The CC results are available in the 2's complement CCOUT[15:0] counter. The CC can be reset by setting the RSTCC bit. This will reset the digital blocks of the CC and will clear the CCOUT[15:0] counter. The RSTCC bit gets automatically cleared at the end of the reset period which may take up to 40us.

Basic Algorithm Block Diagram



(1) For more reference about how to calculate the ONEC value please check the Calculating ONEC section.

CC Counter Initialization Routine (Command Bytes)

To initialize the CC Counter module, the follow command bytes need to be sent accordingly:

CONFIGURATION STEPS:

Step 1:

1) **Address Byte:** Set Write Bit, Write Register Address number 9 shifted one position to the left. These two steps need to be OR'ed into the same byte. The Command byte to be sent after the procedure explained within this paragraph is: **0x92**
2) **Configuration Byte 1:** Set bits: **STARTCC , RSTCC, CCDITHER** and **CCALA.** Configuration Byte: **0x17.**
3) **Configuration Byte 2: 0x00**
4) **Configuration Byte 3: 0x00**

Step 2:

1) **Address Byte:** Set Write Bit, Write Register Address number 10 shifted one position to the left. These two steps need to be OR'ed into the same byte. The Command byte to be sent after the procedure explained within this paragraph is: **0x94**
2) Write ONEC register with **0x0A3D**

Step 3:

5) **Address Byte:** Set Write Bit, Write Register Address number 9 shifted one position to the left. These two steps need to be OR'ed into the same byte. The Command byte to be sent after the procedure explained within this paragraph is: **0x92**
6) **Configuration Byte 1:** Set bits: **STARTCC , RSTCC, CCDITHER** and CLEAR **CCALA bit.** Configuration Byte: **0x07.**
7) **Configuration Byte 2: 0x00**
8) **Configuration Byte 3: 0x00**

Summarizing:

The command bytes must be assembled as follows:
Command 1: 0x92 , 0x00, 0x00, 0x17
Command 2: 0x94 , 0x00, 0x0A, 0x3D
Command 3: 0x92 , 0x00, 0x00, 0x07

READING PROCEDURE

To Read CC OUT counter, the follow command needs to be sent:

Command Byte: 0x12 , 0x55, 0x55, 0x55 (Where 0x55 bytes are none-care bytes to the MC13892)

NOTE: Up to this point user shall be able to retrieve CC Counter value from MC13892 device.

NOTE: After the device returns the read back value from CC Counter, user must mask the control bits (bits 0-7 of register 9), in order to get the CCOUT counter bits with the result.

Calculating ONEC

Since the resolution of the ADC is much finer than 1C, the ONEC bits have been added to the device in order for the Coulomb Counter to reflect a determined amount of coulombs per increase of the counter, in other words, per LSB.

The process to calculate the ONEC desired value is pretty straight forward:

The resolution of the ADC results in a count of 381.47µC per LSB if ONEC[15:0]=1, so if for example a resolution of 1C per LSB is desired:

ONEC = 1C/381.47µC = 2621 (decimal)