Freescale Semiconductor
User's Guide

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WCT1000 A11 Reference Design Calibration User's Guide

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Contents

1 Input Voltage Calibration

The process of input voltage calibration is as follows:

1. Before the calibration, set LOW_POWER_MODE_SUPPORTED and TOUCH_SENSOR_SUPPORT to FALSE in the example code. Then, the MCU runs at full speed even without charging, and the FreeMASTER GUI can respond quickly when the user performs FOD calibration in debugging mode.
    - Before Tx is powered on, ensure that the Rx is removed and load is disconnected.
    - The calibration process of the input voltage requires library to be running in "debug" mode, and without Rx and load.
    - Use the FreeMASTER GUI to calibrate, and save the constant to flash.
2. When Tx is powered on, measure the input voltage of the VINA signal by a multi-meter, and write it to Step 5) in the following window on the FreeMASTER GUI.

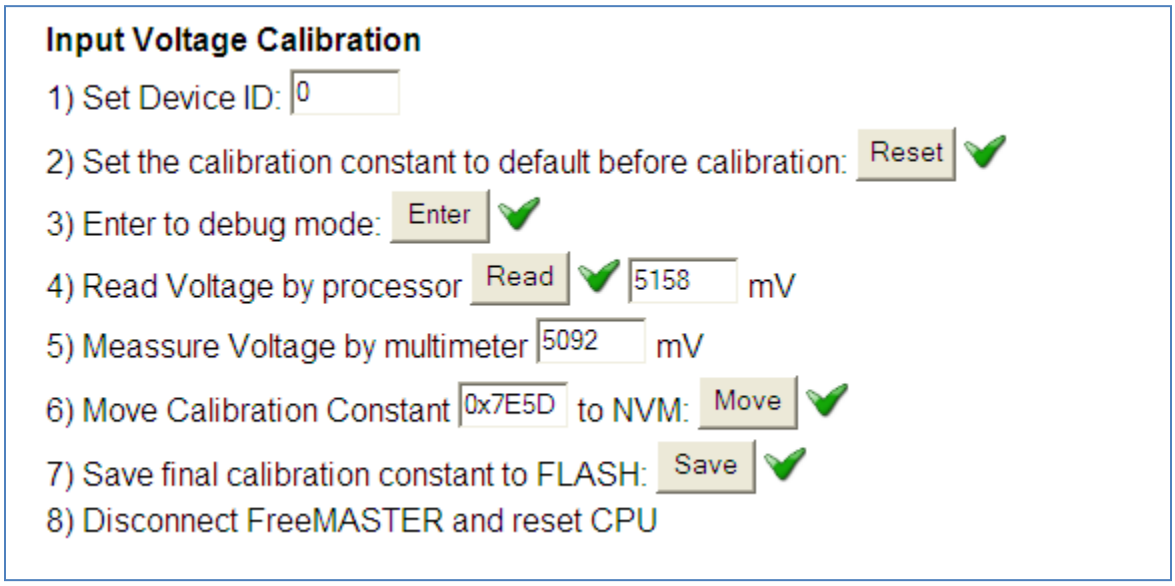

Figure 1 Input voltage calibration

3. Read out the input Voltage Calibration Constant on the "Calibration" page of the FreeMASTER GUI to ensure that it is saved successfully.

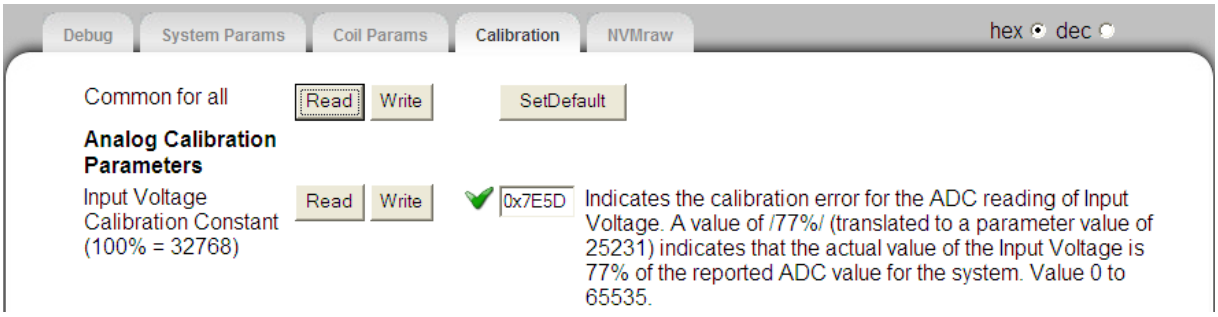

Figure 2 Reading out the input voltage calibration constant

2 Input Current Calibration

The process of input current calibration is as follows:

1. Power on the wireless charging Tx board while the load is disconnected.

   The calibration process of the input current requires library to be running in "debug" mode, and without Rx on.

2. Ensure that Rx is removed. Add electronic load or resistors between Vin and Ground to draw current.

3. Change load current from 50 mA to 1500 mA. Record the actual current measured by a multi-meter.

   Use the FreeMASTER GUI to do the calibration, and save the constant to flash.

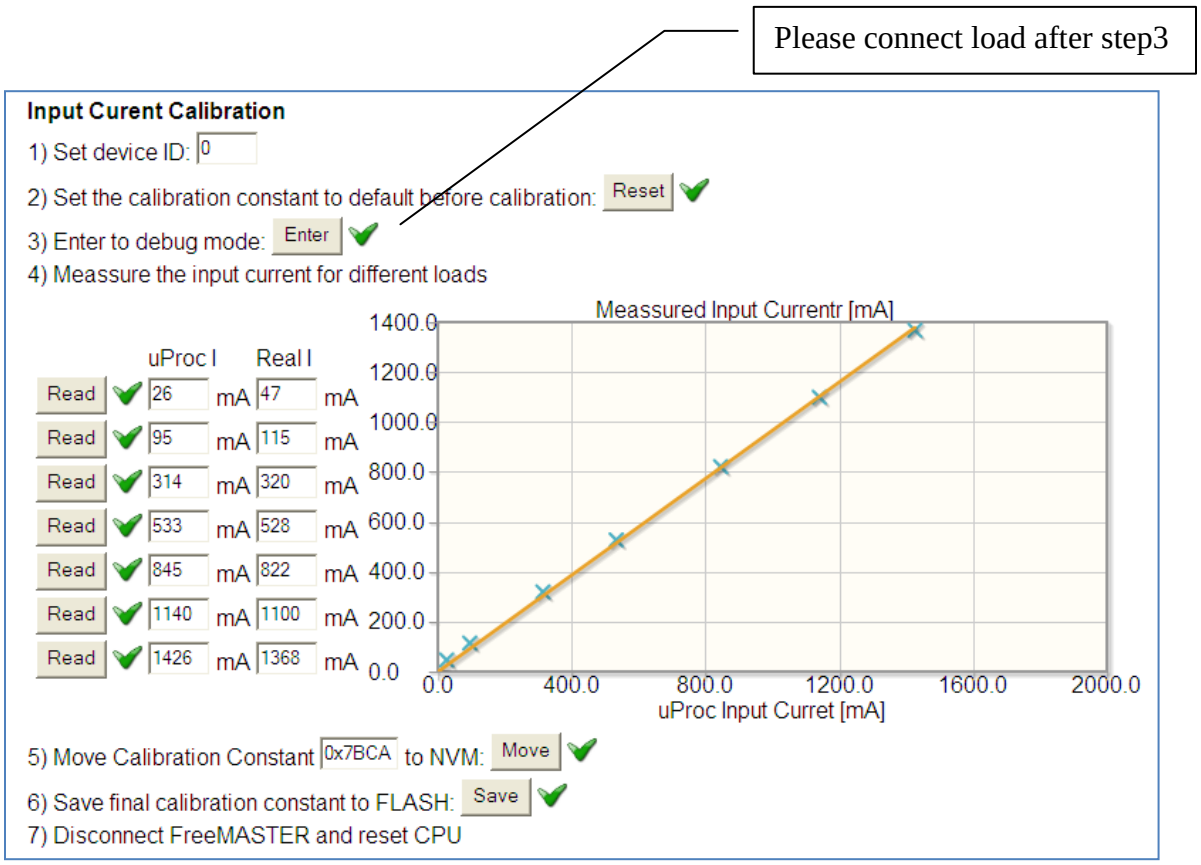

Figure 3 Input current calibration

4. Read out the Input Current Calibration Constant on the "Calibration" page of the FreeMASTER GUI to ensure that it is saved successfully. Before the following FOD calibration, disconnect FreeMASTER and reset the Tx board.

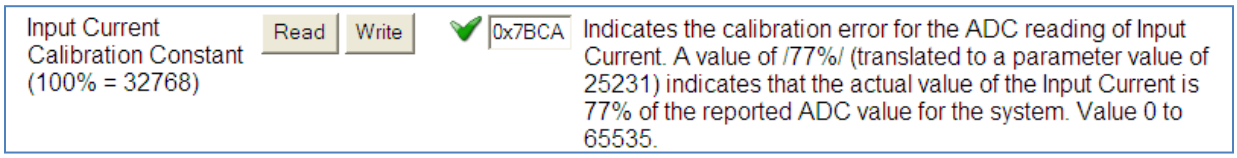

Figure 4 Reading out the input current calibration constant

3 FOD Calibration

This is the FOD calibration process:

1. The calibration process of foreign object detection algorithm requires that the library is running in debug mode and that the calibration of the Input Voltage and Input Current is complete. The calibration must be done without Rx and load.
    - Follow the "Input Voltage Calibration" instructions.
    - Follow the "Input Current Calibration" instructions.
2. Read out the coil current and input power by setting the coil frequency range from 205 KHz to 115 KHz. On the FreeMASTER GUI, perform these steps to get the FOD coefficients, C5, C6, and C7.

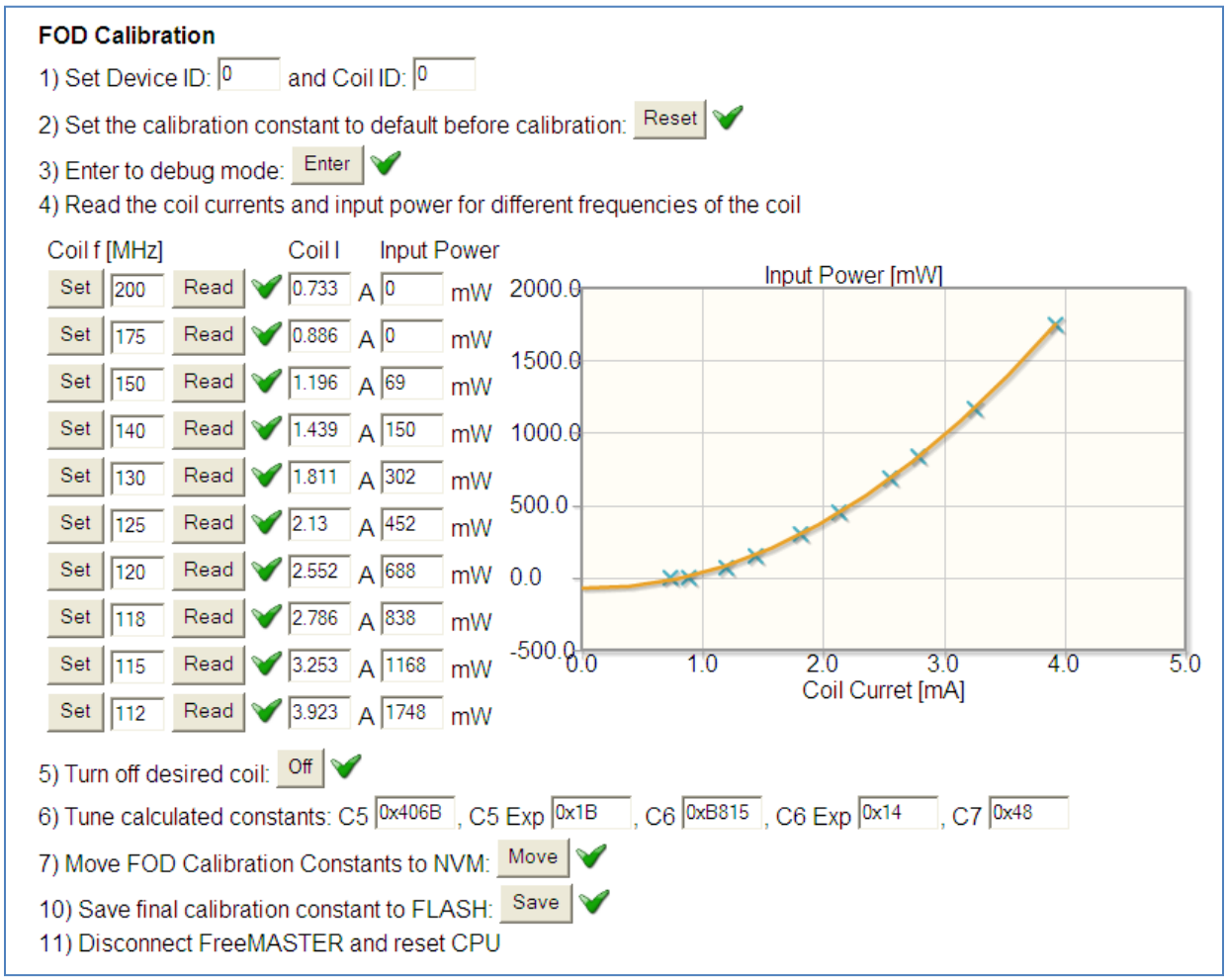

Figure 5 Reading out the coil current and input power

3. Read out the "Power Loss Characterization Parameters" in the "Calibration" page of FreeMASTER GUI to ensure that it is saved successfully.

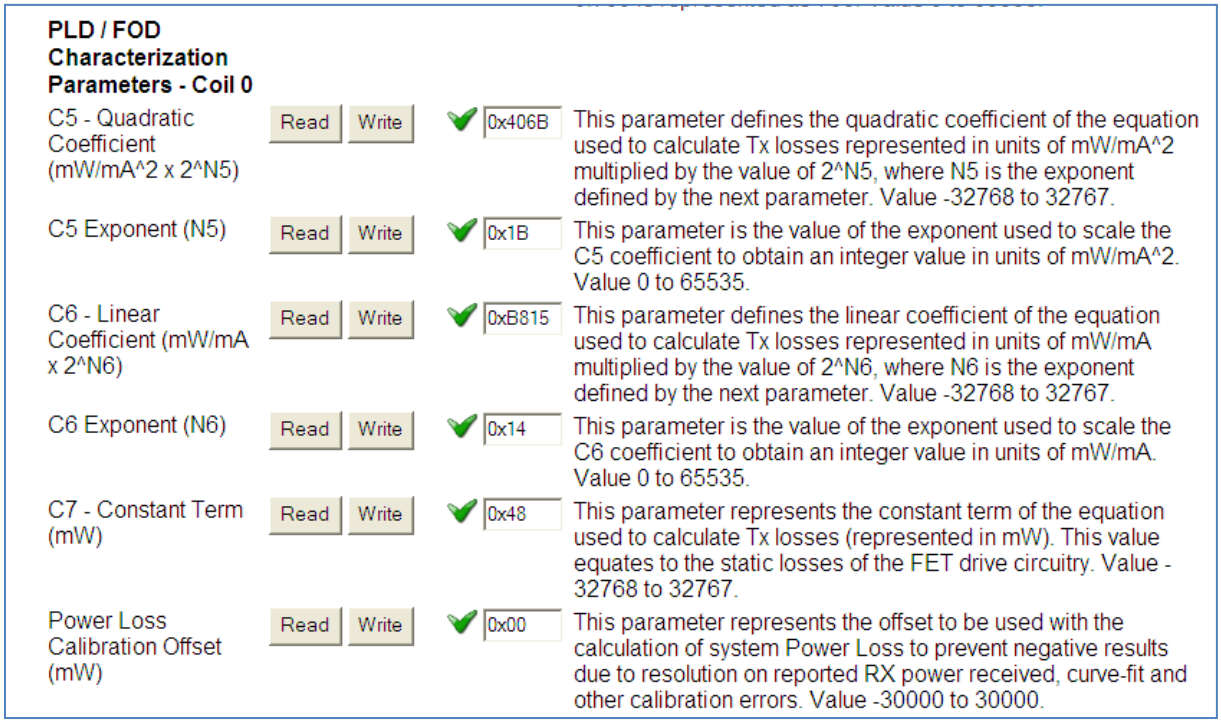

Figure 6 Reading out the power loss characterization parameters

4 FOD Normalization

The FOD normalization involves equalizing the power-loss curve, which occurs when the lost value increases with the increase of the load. In this case, the power loss curve may be higher than the threshold even when there is no foreign object. To resolve the issue, Freescale provides the normalization tool through FreeMASTER GUI to fine-tune the FOD performance of customers' boards.

This is the FOD normalization process:

1. Ensure that the voltage and current are input, and that the FOD calibration is complete.
2. Follow the normalization steps on the FreeMASTER GUI as shown in the figure. Before the test, reset the parameter and exit debug mode. Do the test with a standard calibrated Qi 1.1 Rx, such as TPR#5. The load range is from 50 mA to 1000 mA.

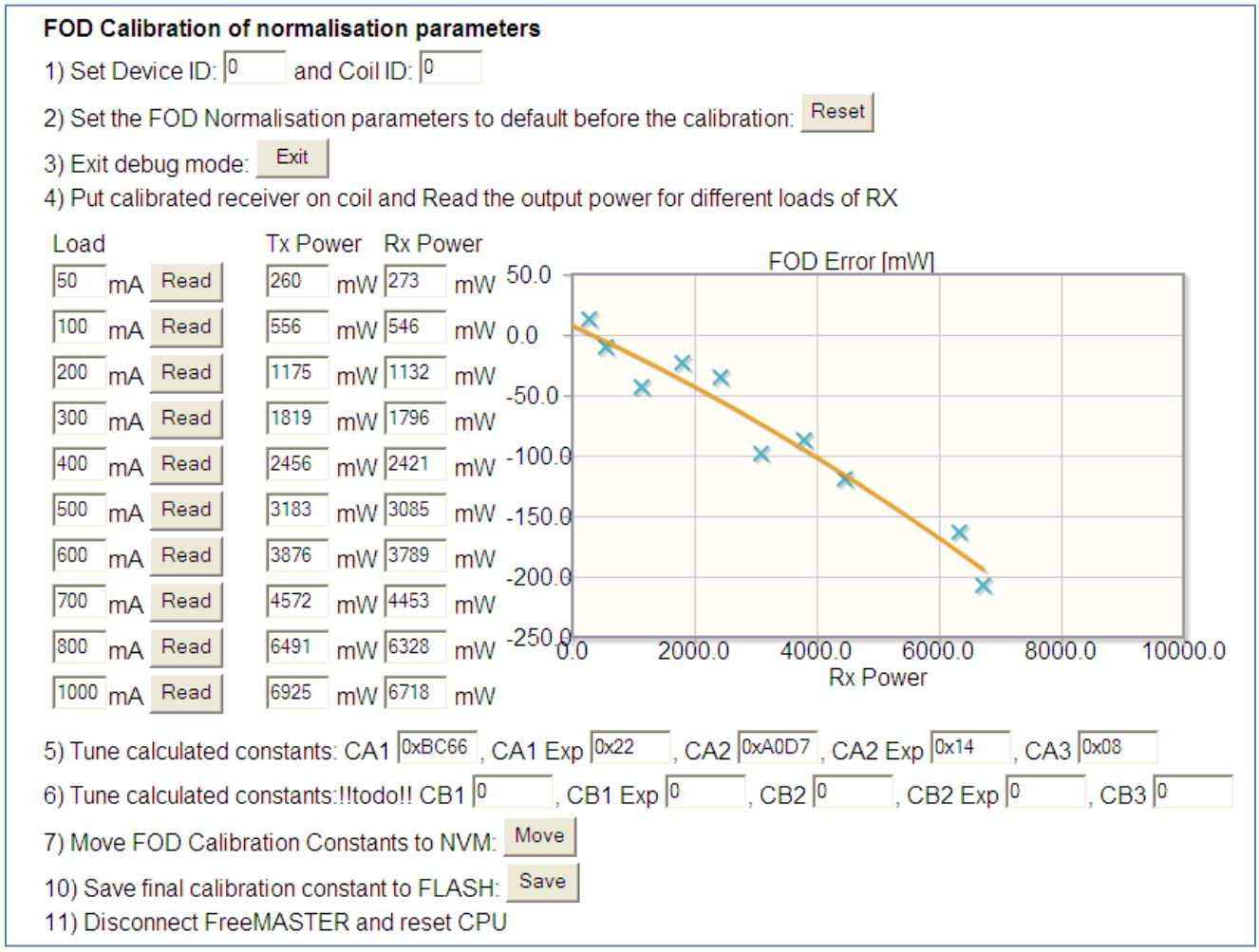

Figure 7 FOD calibration of normalization parameters

3. Read out the "Power Loss Characterization Parameters" on the "Calibration" page of the FreeMASTER GUI to ensure that the parameters are saved successfully.

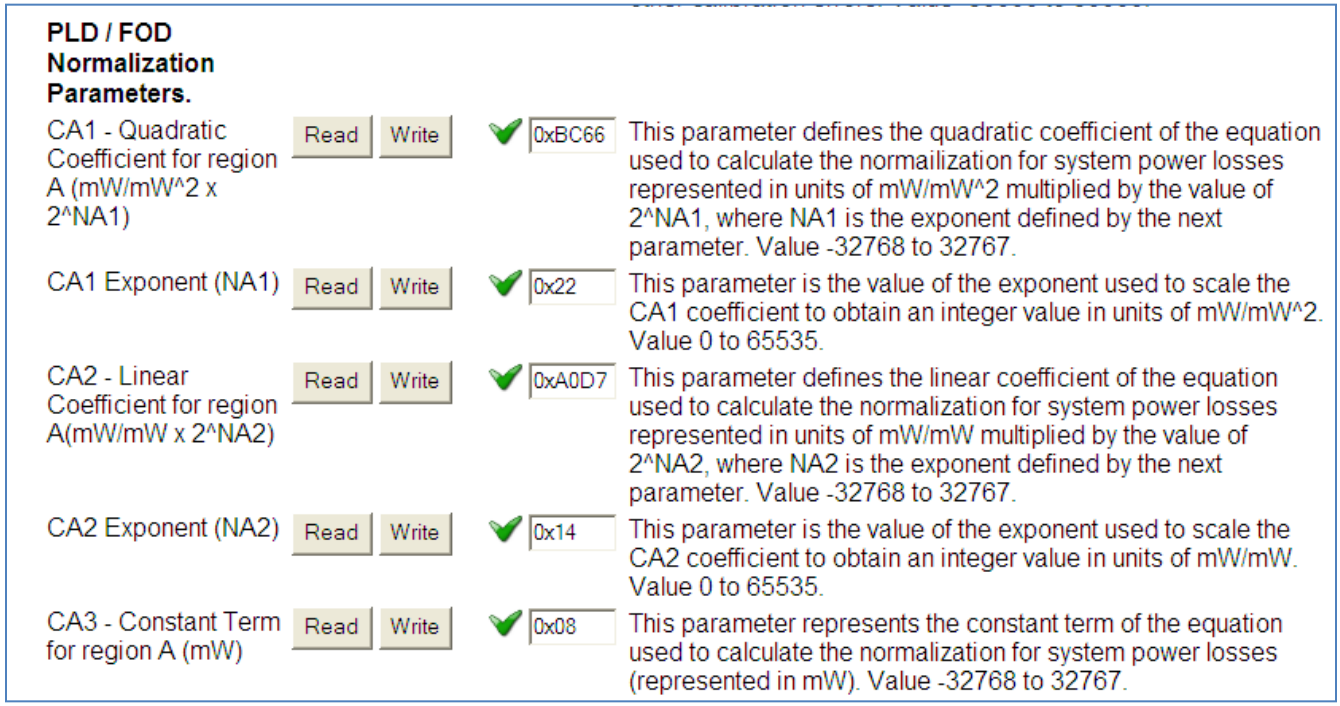

Figure 8 Reading out the power loss characterization parameters

5 RS FOD Calibration

Resonance Shift FOD (RS-FOD) is one optional solution to detect FO in standby mode when Rx is not on the surface of Tx. This can ensure that the charging never starts power transfer if FO is present. It does not belong to Qi 1.1, so the feature is disabled by default, and you can skip this step by default. Normal FOD with the power loss solution has been involved in the demo image. You need to enable the feature before performing the calibration, if the feature is required. Follow Section “Enabling the RS FOD function” of the *WCT1000 A11 Reference Design System User’s Guide* (WCT1000SYSUG) to rebuild the project. As the detection threshold is impacted by the input voltage and the hardware, the parameters used to calculate the threshold should be calibrated through the FreeMASTER GUI.

The RS FOD calibration process is as follows:

1. Close the low power mode by setting the macro LOW_POWER_MODE_SUPPORTED false in application_cfg.h, and rebuild the project.
2. Ensure that the voltage and current calibration is completed, and exit from the debug mode.
3. Ignore the reset step, which is useless here. Follow the calibration Step 4 on the FreeMASTER GUI as shown in the following figure. Set different input voltages from 4.8 V to 5.3 V separately, and click “Read” to get the calibration curve. Then the parameters Ca and Cb are obtained. Click “Move” to move the new parameters to flash, and then click “Save”.

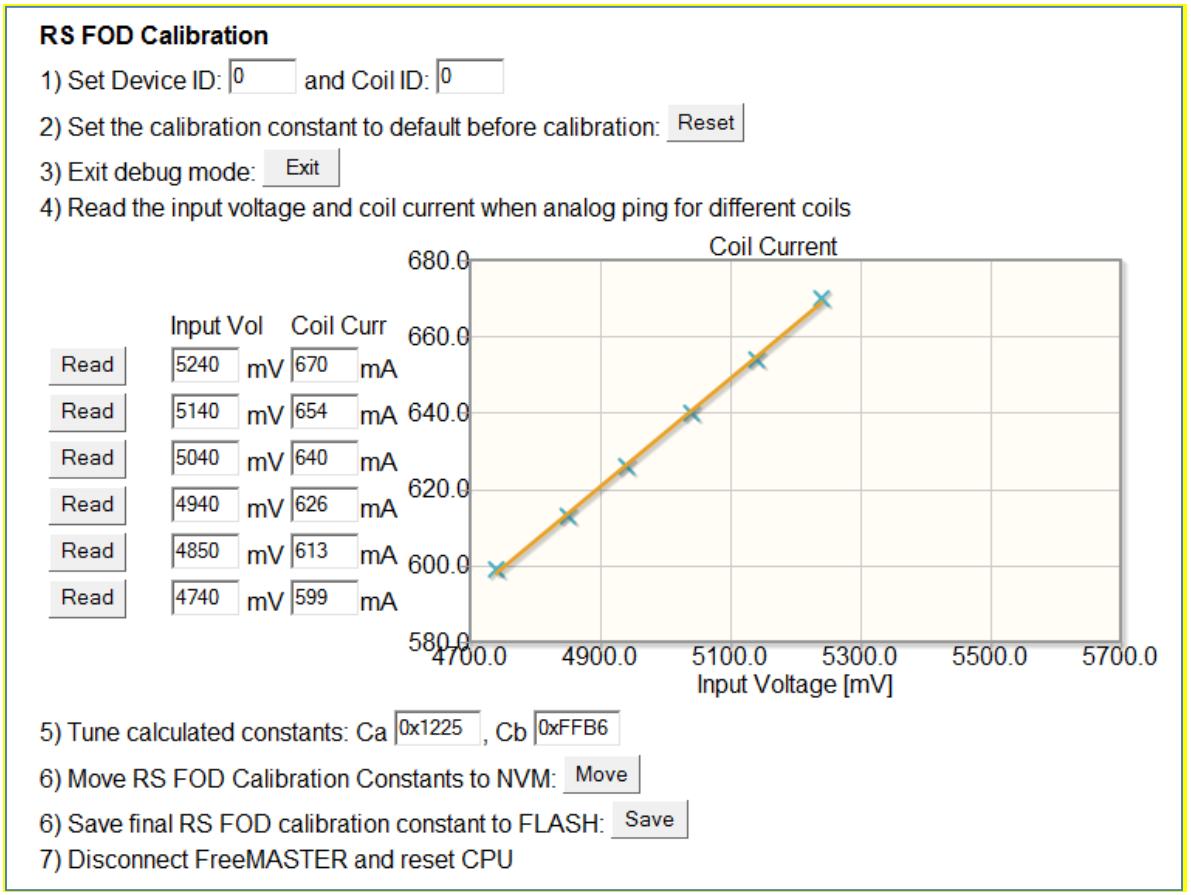

Figure 9 RS FOD calibration parameters

4. Read out the "RSFOD Calibration Parameters" on the "Calibration" page of the FreeMASTER GUI to ensure that the parameters are saved successfully.

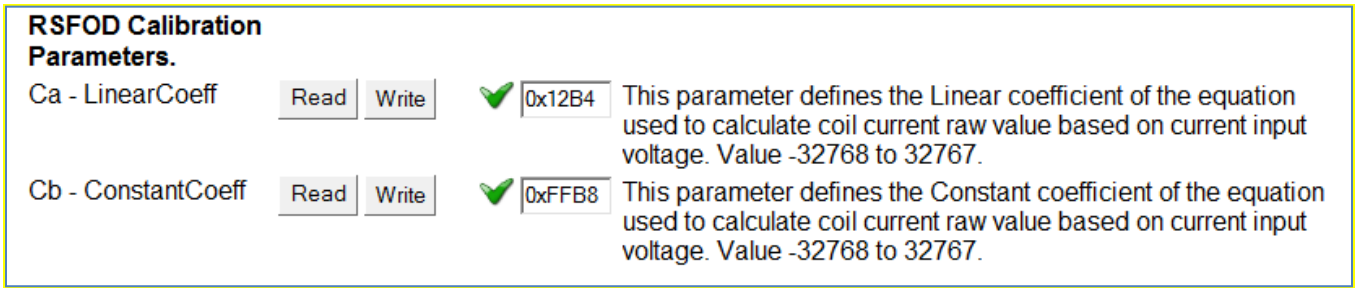

Figure 10 Reading out the RS FOD calibration parameters

6 EEdata

After the calibration is complete, you need to copy the whole EEdata table on the “NVMRaw” page and save to the WCT1000 example project. Click the "Common for all" and "Read" buttons on all the three parameter pages (System, Coil, and Calibration) to generate the table of the NVMraw page. Then, select the whole table and right-click it to copy it to the example project code, EEdata_FlashDefaults.asm.

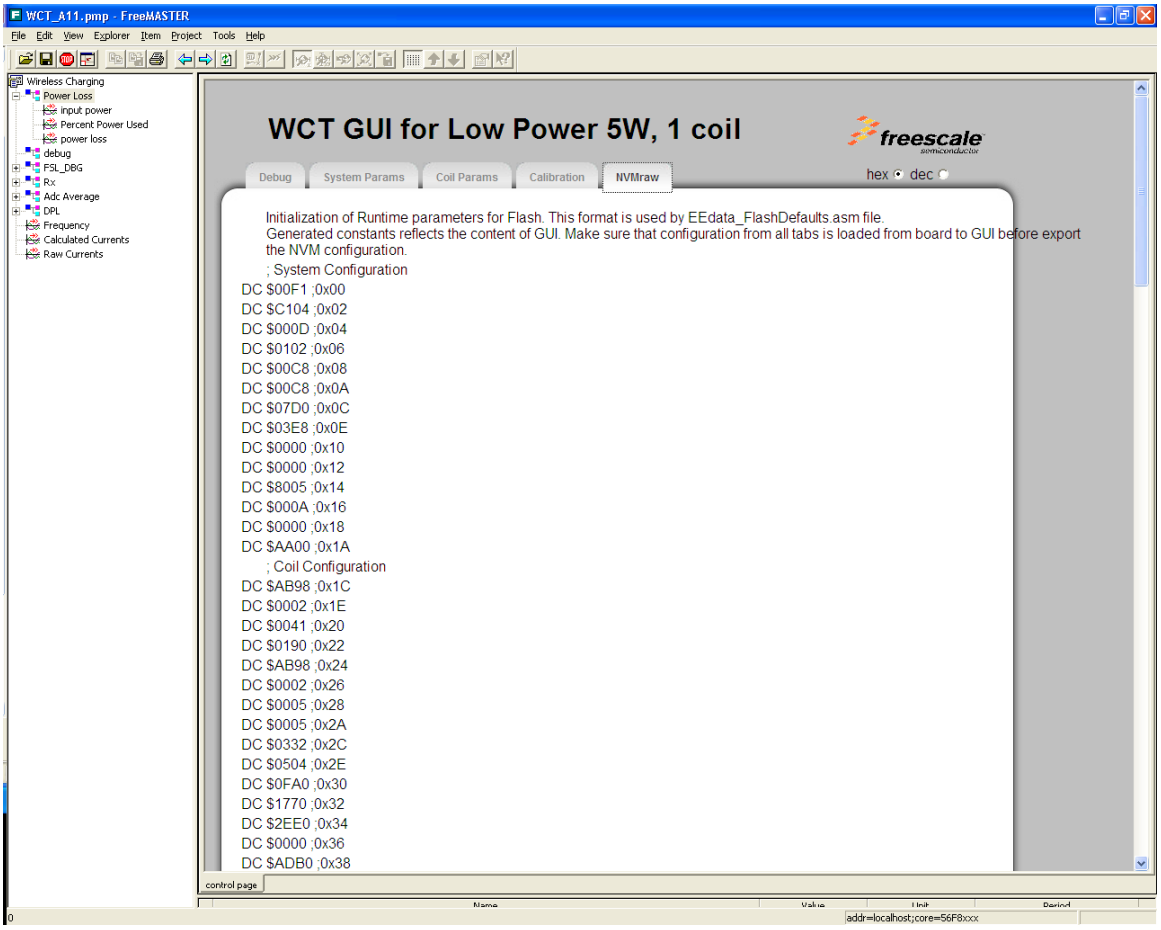

Figure 11 NVMRaw page

7 Revision History

Revision	Date	Description
1.0	None	No document is released
2.1	August, 2013	Initial release
3.0	November, 2013	Updated for calibration on the FreeMASTER GUI
3.1	January, 2014	FOD normalization steps added
3.3	September, 2014	RS FOD calibration steps added

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