

A low-cost SoC power measurement platform

Evaluating software impact on power consumption is not easy. Using a simple multimeter on the power line is not accurate enough because there are big variation in input current. A higher sampling frequency is needed. Also you have to correlate the power data with the various phases of a software (separate initialisation from the computation part for example).

Our idea is to build a low-cost power measurement tool around a cheap microcontroller, in this case from the pic18 family. We use its ADC to get current and voltage sample of the power line at a high enough rate. We also use its GPIOs as input, connected to GPIOs of the SoC being evaluated, to track and report various software state on the SoC.

We choose to use a pic18fj53. Its has a 12 bits ADC which can do up to 80ksp/s, runs at 48Mhz and has a USB interface. Unfortunately during developement we found that the USB interface, when enabled, would dramatically decrease the ADC's accuracy. So we choose to use the serial port on the PIC side and added an external USB/serial bridge.

The requirement are:

- inputs between 0 and 2A, 0 and 20V
- 4 GPIOs to connect with the SoC being evaluated

A 1.350V precision diode is used as a voltage reference for the ADC. The input voltage is feed to ADC input 0 (AN0) via a voltage diviser. To cover the input range with enough accuracy 3 different values can be selected with a jumper.

3 Shunt resistors are used for current measurements, selectable with a jumper. An amplifier will multiply the shunt's voltage before feeding it to AN1.

RB0-RB3 are used to get 4 GPIO status from the SoC.