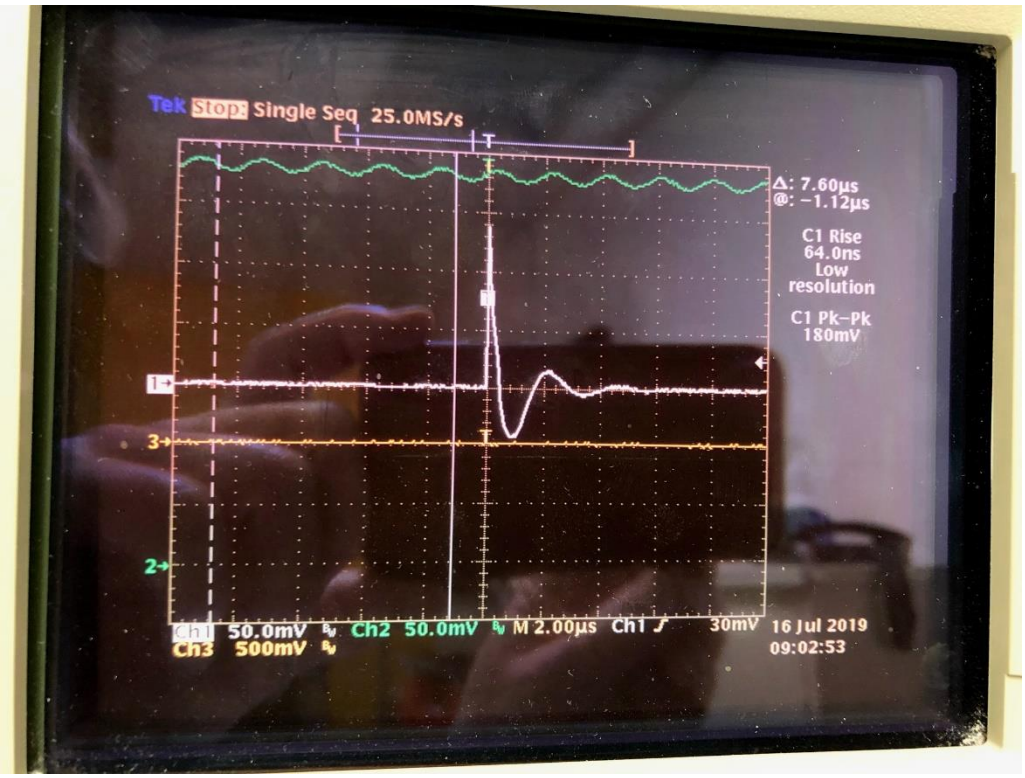
MSP430F135 ADC glitch problem

We have been encountering a problem on about 10% of our detector boards where the ADC in the MSP430F135 MCU will returned corrupted measurements. This will happen at random times when temperature cycling the boards during a system burn-in process. This will show up as out or range reading of 2+ counts on a heavy averaged sample base of 2048 readings with no change in the input signal. The PCBA uses two channels (P6.3 & P6.4) of the ADC and runs in a continuous sampling mode with a 43.6 µsec conversion interval per channel. So, there is an ADC conversion interval of 21.9 µsec between AN0 and AN1

The only cure for a defective PCBA is to replace the MCU and then the board has proper function and stable ADC readings.

The ADC sampling/conversion produces a significant glitch on the signal driving the ADC input. The signal is driven by an INA121 Instrumentation Amplifier in a gain of 6 configuration. It has a low output impedance in the range of a few ohms and should have minimal loading from the sampling circuit in the MCU. We have disabled the port buffers for the analog input ports and are using the "Pulse Sample Mode" of Figure 17-4 of the reference manual and the "Repeat-sequence-of-channels" mode of conversions listed in Table 17-1 of the reference manual. We are also using the internal reference of the MCU set to 1.50 volts with the recommended filtering capacitance values of Fig 5-15 of the MCU data sheet.

Zoom in picture of sampling glitch on AN0 (P6.3)



Note that Ch1 is using a DC offset to expand the DC range to see the small signal changes when actual signal is active. Current input is resting at dark state with DC level of

Does this sampling glitch appear to be typical for the MSP430F135 parts? All the PCBA display a similar glitch when doing ADC conversions.

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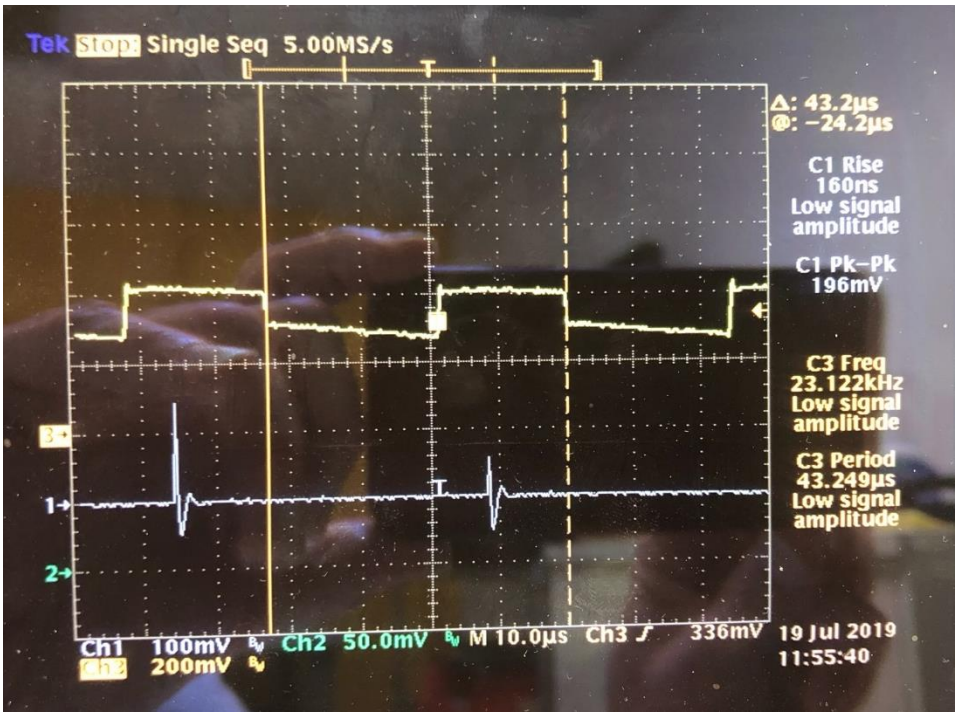
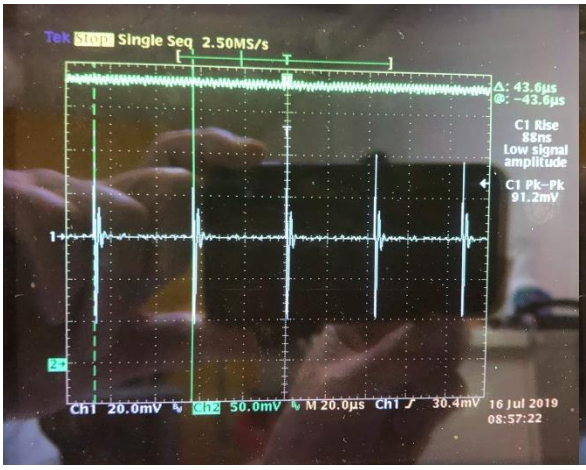
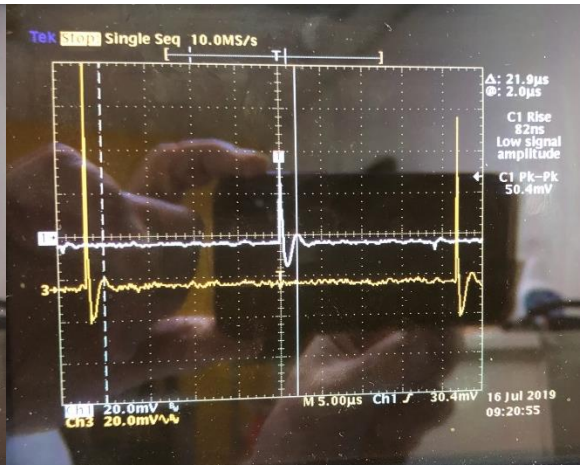
When the ADC is disconnected from the INA121 output by removing a 0 ohm resistor the ADC glitch is not observed on the analog signal. There is still a glitch of different wave shape on the ADC input pin of the MCU. What is the cause of this waveform on the ADC input pin? It has the same frequency as the sampling rate used by the ADC. Ch3 of the scope picture below shows the disconnected ADC input and C1 shows a connected ADC input glitch.



We want to know, when is the actual ADC conversion being done in relation to the start point of the glitch? We are assuming the glitch is being caused by the input mux switching on and glitching the amplifier output. We want insure we have left enough delay in the ADC set-up in pulse sampling to have the input stable after the mux glitch.

We have a small PCBA with two analog channels feeding 2 ADC inputs of the MSP430F135 MCU. The pictures show the glitch interval for AN0 on a period of 43.6 µsec the interleaving of Ch0 and Ch1 ADC inputs with 21.9 µsec between conversions.





Your help in understand the details of the ADC operation is greatly appreciated.