

Calculating the Maximum Output Sample Rate and Specifications Bandwidth of the HSP50214

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Output Sample Rate and Bandwidth Specifications

- Output Samples at 6.6MSPS with Output Bandwidths to 500kHz (Preliminary Data Sheet)
- Output Samples at 8.2MSPS with Output Bandwidths to 625kHz (HSP50214 Data Sheet)
- Output Samples at 12.9MSPS with Output Bandwidths to 982kHz (HSP50214A Data Sheet, No Discriminator)
- Output Samples at 12.9MSPS with Output Bandwidths to 982kHz (HSP50214B Data Sheet)

Calculating the Low Pass Bandwidth

The specifications listed above use one halfband filter section. The throughput is set by the selected filters and the PROCCLK rate. The AGC multiplier requires 6 PROCCLK cycles for processing, so the rate into the Re-Sampler filter must be PROCCLK/6 maximum. The halfband requires 7 clocks to calculate an output. This means the limiting rate into the halfband is PROCCLK/7. The maximum rate of PROCCLK is 35MHz (28MHz in the preliminary data sheet and 55MHz in the A and B data sheets). Thus, PROCCLK/7 is 5MHz (4MHz for the preliminary data sheet/7.857MHz for the A and B data sheets). CLKIN is not limited, but the input signal must be decimated into the input rate of the Halfband filter section so as to meet the maximum PROCCLK specification. See Figure 1.

The input of the halfband filter is limited to 5MHz (4MHz; 7.857MHz). The usable bandwidth out of the halfband filter that guarantees that there is negligible (< -84dBc) alias induced degradation of dynamic range, is approximately 1/4 the output rate of the halfband filter (this is 1/8 CIC Filter Output Rate).

Calculating the Output Rate

The last item is the interpolation filters. With 2 halfband filters activated (no re-sampler filter), 17 clocks are required to generate the filter output. Thus, the maximum input rate into the interpolation filters is 35MHz/17 = 2.059MHz (28MHz/17 = 1.647MHz; 55MHz/17 = 3.235MHz). The output rate is 4 times this, or 4(2.059) = 8.236MSPS (4(1.647) = 6.588MSPS; 4(3.235) = 12.941MSPS).

Now Let's Calculate Low Pass Bandwidth and Output Sample Rate for the Preliminary Data Sheet:

- 28MHz/7 = 4MHz Halfband input rate
- 4MHz/8 = **500kHz** usable full dynamic range (>84dB) bandwidth (1MHz IF equivalent BW)

The maximum output sample rate is:

- $4(28\text{MHz}/17) = 4(1.647\text{MHz}) = \mathbf{6.588\text{MHz}}$

The Low Pass Bandwidth and Output Sample Rate for the HSP50214 Data Sheet Is:

- 35MHz/7 = 5MHz halfband input rate
- 5MHz/8 = **625kHz** usable full dynamic range (>84dB) bandwidth (1.25MHz IF equivalent BW)

The maximum output sample rate is:

- $4(35\text{MHz}/17) = 4(2.059\text{MHz}) = \mathbf{8.236\text{MHz}}$

The Low Pass Bandwidth and Output Sample Rate for the A and B Version Sheets are:

- 55MHz/7 = 7.86MHz Halfband input rate

7.86MHz/8 = **982kHz** usable full dynamic range (>84dB) bandwidth (1.96MHz IF equivalent BW)

The maximum output sample rate is:

- $4(55\text{MHz}/17) = 4(3.24\text{MHz}) = \mathbf{12.94\text{MHz}}$

† The A version does not have the discriminator FIR engaged when this performance is obtained. There is no limitation in the B version to obtain these results.

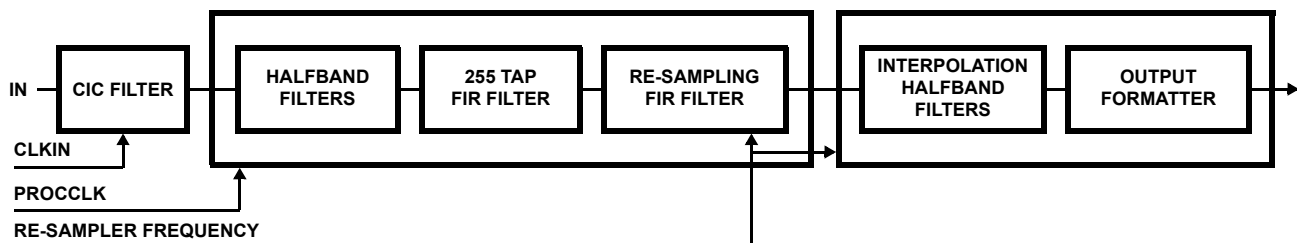


FIGURE 1. PDC INTERNAL CLOCKING

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