Development Kit User's Guide
QF4A512 Programmable Signal Converter

1) Introduction

The Development Kit User's Guide for the QF4A512 describes the following:

- Board Layout / Prototyping area definition.
- Changing the default configuration of AC coupled single ended.
- Input level protection scheme.
- Running external target hardware using Quickfilter's PC software.
- Running Quickfilter's hardware on the development board using an external microcontroller.
- Using an external clock source.
- List of Test Point Definitions.
- Schematics.

2) Board Layout / Prototyping area definition:

The QF4A512 – DK development board was designed to be able to add amplification, very high input impedance, or excitation current for specific sensors in the prototyping area.

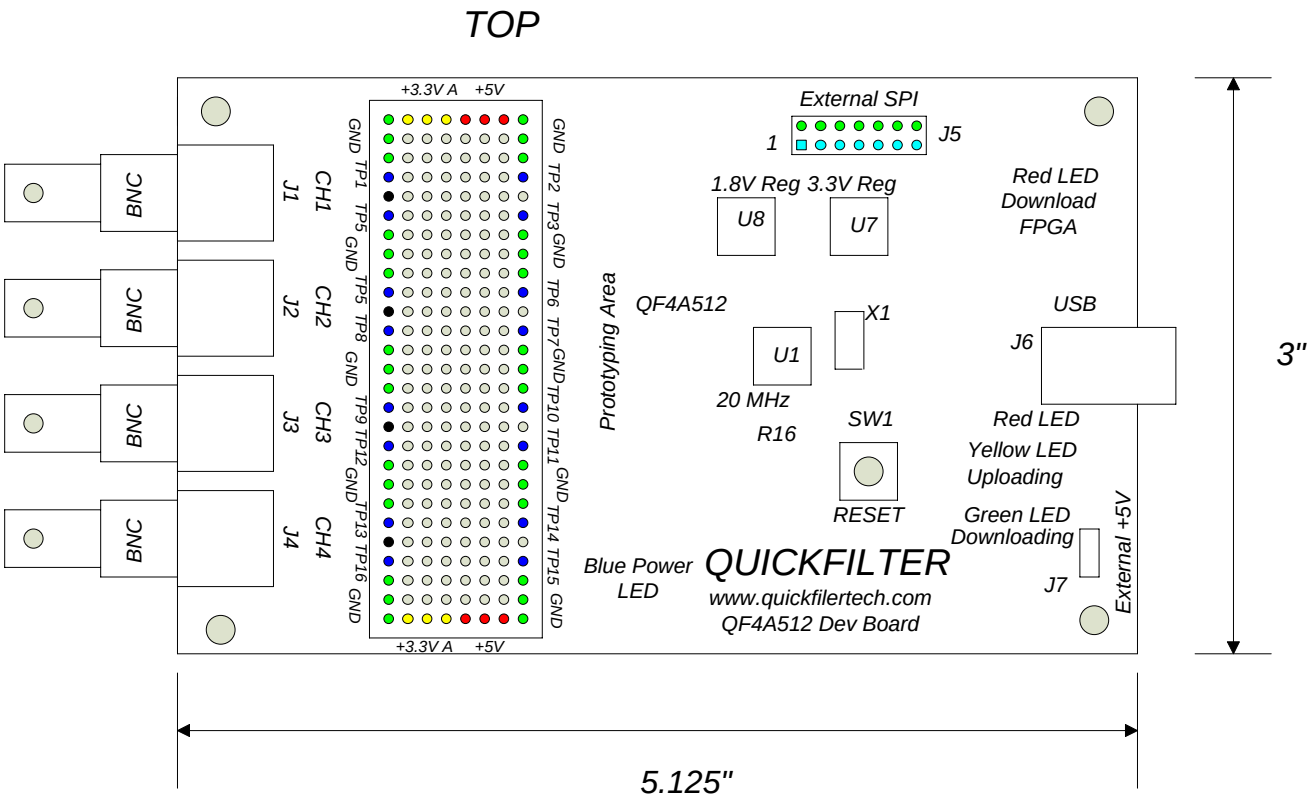


Figure 1

Supplying Power:

Figure 1 shows red circles for +4.5 Volts brought to the prototyping area, yellow circles for +3.3V, green for Ground, dark blue for the test points, grey no connect, and black tied together as a 4 node bus (rev 2.4 boards only). Note that the +4.5V can be increased to +5V directly off of the USB power by shorting diode D8 on the back side of the board. D8 was designed to protect the USB power from someone adding too much external power through J7. In fact you could supply for example +12V through J7, remove diode D8, and a +12Volt supply would be fed through the "+5V" prototyping area. The on board regulators can handle the +12V drop to +3.3V and the USB power is protected. Adding additional power may be useful if more than 60mA of power is needed for the prototyping area, or if a very clean supply is needed. For example a battery pack could be connected to J7. See Page 5 of the schematics for a detailed power supply diagram.

Adding circuits in the analog input stage:
Figure 1 shows Test points which are actually the connection points for signals coming into the prototyping area.

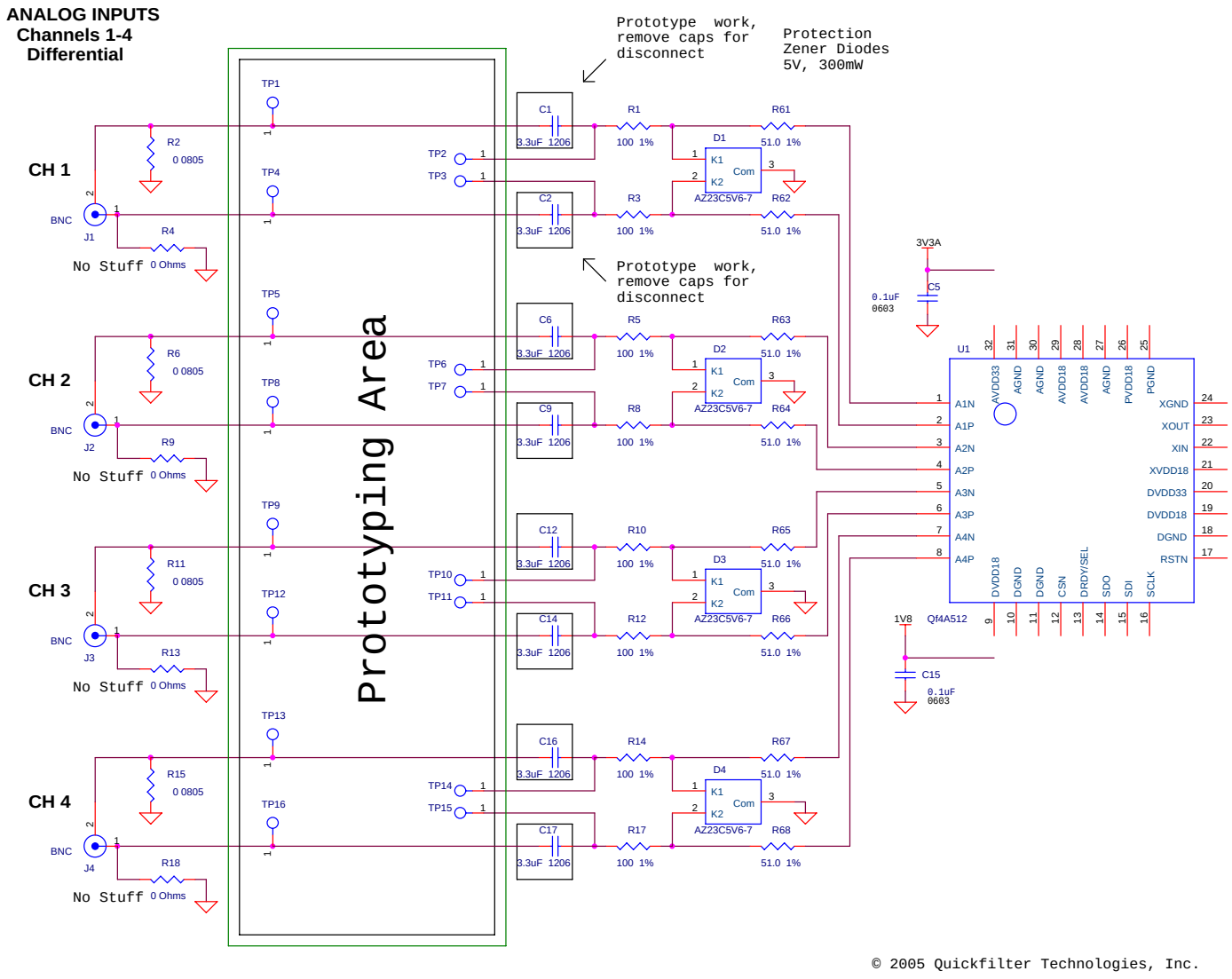


Figure 2

Figure 2 shows the actual test points that connect the signal path through the prototyping area. By removing for example C2, Channel 1 is still single ended since C1 has a signal path to ground, however the input path now comes into BNC connector J1 to TP4. The designer can now add circuitry from TP4 and connect it's output to TP3 going into the QF4A512's channel 1.

3) Changing the default configuration of AC coupled single ended:

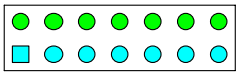
Changing the default configuration of AC coupled single ended to differential or DC coupled can be done by the following. For differential applications the resistor R2 to ground can be removed see Figure 2. In this case Channel 1 is now differential AC coupled. If DC coupling is desired C2 can be shorted. See application note QFAN004 for DC measurement requirements which specifies a minimum 10K resistor in series. This resistor can be added by replacing R3 in channel 1 for single ended applications, or R1 and R3 for differential applications.

4) Input level protection scheme:

The QF4A512 development board was designed to be able to take large input voltages > the normal maximum 2Vpp. A large input voltage of say 25Vpp AC will simple show a clipping square wave on Channel 1 when for example Zener diode D1 turns on which is current limited by series resistor R1. This means the QF4A512 actually sees a 5.1Vpp square wave coming into channel 1. This square wave is then further current limited by the 51 ohm resistor R2 going into the QF4A512. This over voltage of 5.1 Volts turns on the internal protection diodes of the QF4A512 showing distortion on the FFT by multiple harmonics. No damage occurs.

5) Running external target hardware using Quickfilter's PC software:

The Designer can run external QF4A512 hardware by hooking up the external SPI interface to their target hardware. By using CS2 Pin 13 on the header J5 and selecting "Use programming adapter board" in Quickfilter Pro software, CS2 is selected and CS1 which goes to the on board QF4A512 U1 is shut off. A second method is manually removing zero ohm resistor R16 which hooks CS1 to U1. In this case CS1 Pin 9 could be selected for the Chip Select control externally and the Quickfilter software run normally.



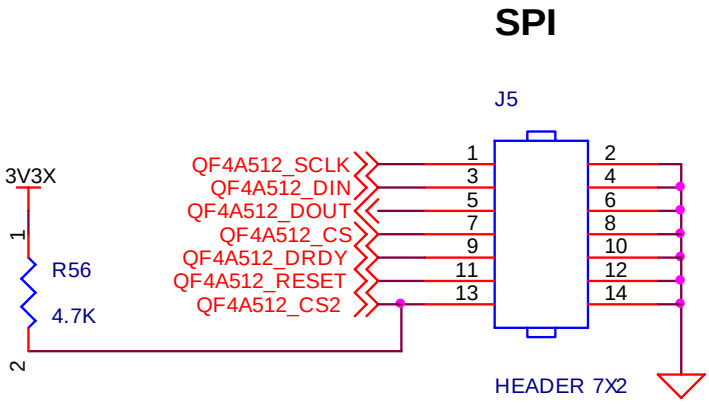


Figure 3

6) Running the Quickfilter development board's QF4A512 using and external microcontroller:

The QF4A512 – DK development board was designed for all signals to the QF4A512 to be tri-stated on power up through either the USB power or externally connected power J7. The QF4A512 is ready for communication through the external SPI connector J5. The correct chip select is Pin 7 QF4A512_CS. See Figure 3 above. No PC software is required for this feature. Just plug the development board into a USB and start communicating with the QF4A512 through J5. It is also possible to program the QF4A512 with Quickfilter Pro Software and then tri-state the controlling pins without losing power so that all the external microcontroller needs to do is talk to the QF4A512. This control is done in Quickfilter Pro Software.

7) Using an external clock source:

Since the crystal is lightly loaded, an external driving clock source can directly run the internal PLL.
You do not need to remove the 1 Meg resistor, crystal or 18 pF loading capacitors from the development board.
Simply apply the external clock source to Test Point TP22. Make sure to tell the Quickfilter software the external clock frequency used when regenerating the QFP file.

Designer's note – The allowable input range is 5 MHz to 200 MHz.

The clock input on Pin 22 to the phase lock loop is a 1.8 Volt level. Therefore the amplitude of the incoming clock source should be 1.62 to 1.98 Volts Peak to peak. Since the input is AC coupled, a DC offset can exist. The clock can be a sine wave, or square wave.

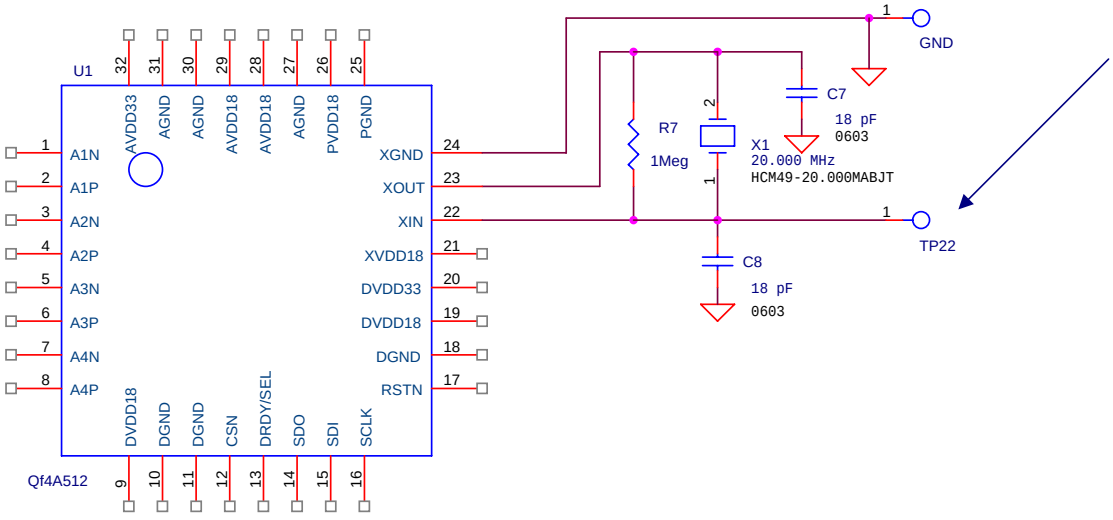


Figure 4

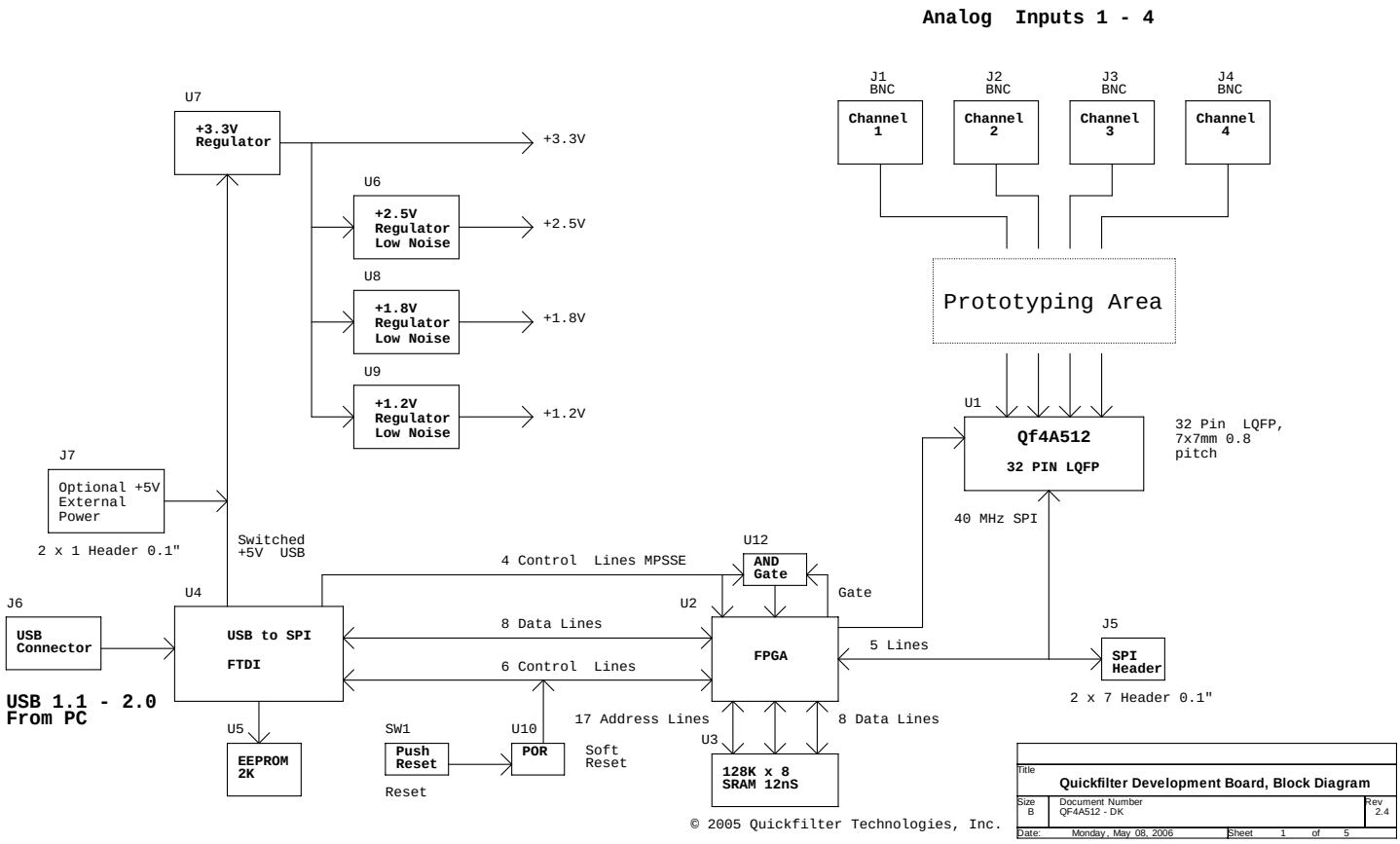
8) List of Test Point Definitions:

TP1 = Analog Input BNC Channel 1 (Negative)
TP2 = Analog Input Prototyping Area Channel 1 (Negative)
TP3 = Analog Input Prototyping Area Channel 1 (Positive)
TP4 = Analog Input BNC Channel 1 (Positive)
TP5 = Analog Input BNC Channel 2 (Negative)
TP6 = Analog Input Prototyping Area Channel 2 (Negative)
TP7 = Analog Input Prototyping Area Channel 2 (Positive)
TP8 = Analog Input BNC Channel 2 (Positive)
TP9 = Analog Input BNC Channel 3 (Negative)
TP10 = Analog Input Prototyping Area Channel 3 (Negative)
TP11 = Analog Input Prototyping Area Channel 3 (Positive)
TP12 = Analog Input BNC Channel 3 (Positive)
TP13 = Analog Input BNC Channel 4 (Negative)
TP14 = Analog Input Prototyping Area Channel 4 (Negative)
TP15 = Analog Input Prototyping Area Channel 4 (Positive)
TP16 = Analog Input BNC Channel 4 (Positive)
TP17 = +2.5V Power Supply
TP18 = +3.3V Power Supply
TP19 = +5V USB Supply minus D8 voltage drop = +4.5V
TP20 = +1.8V Power Supply
TP21 = +1.2V Power Supply
TP22 = External Clock connection point (Should see 20MHz)
TP23 = +3.3V Analog Power Supply

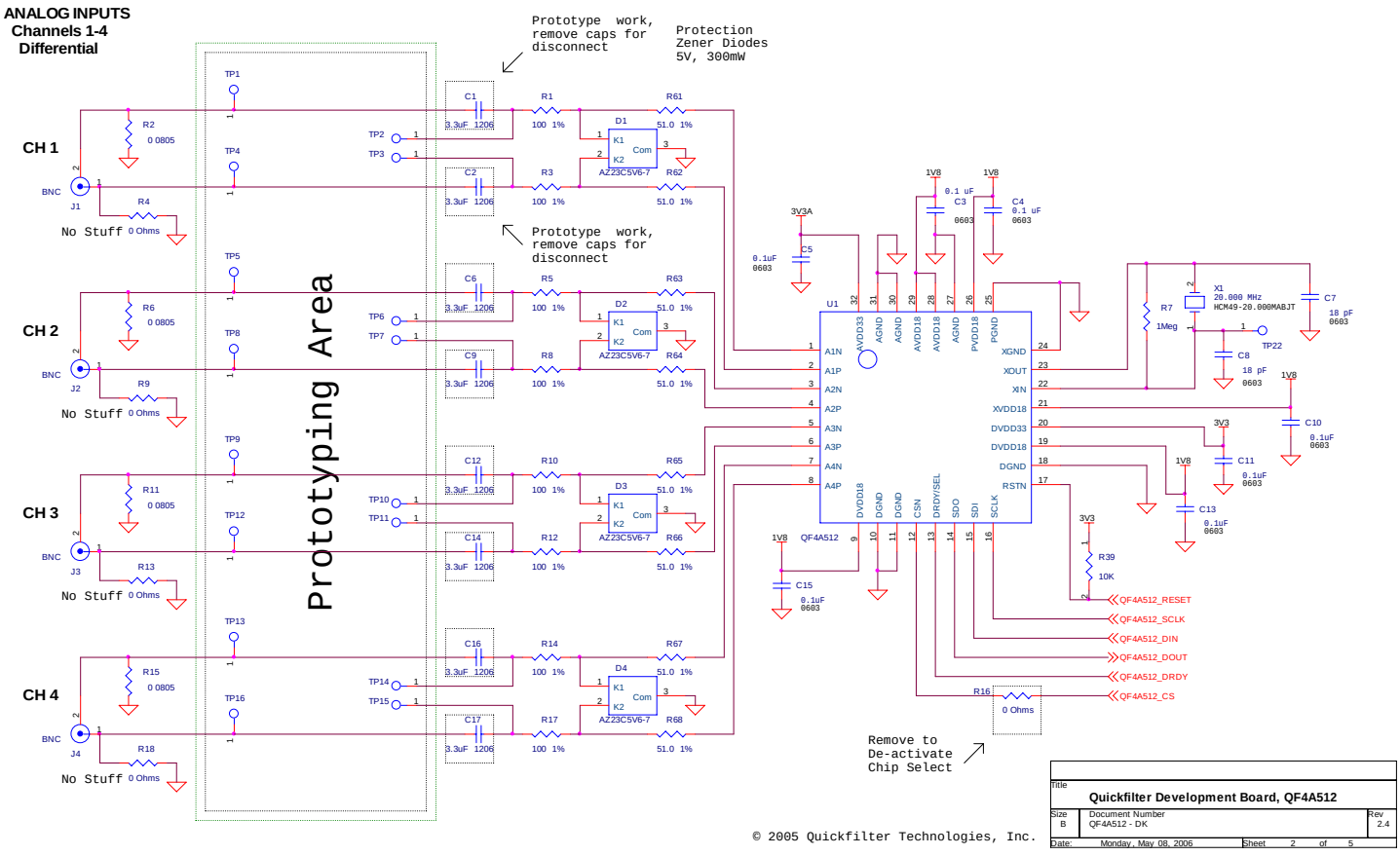
9) Schematics:

The following five pages are the full schematics for the QF4A512 Development Kit.

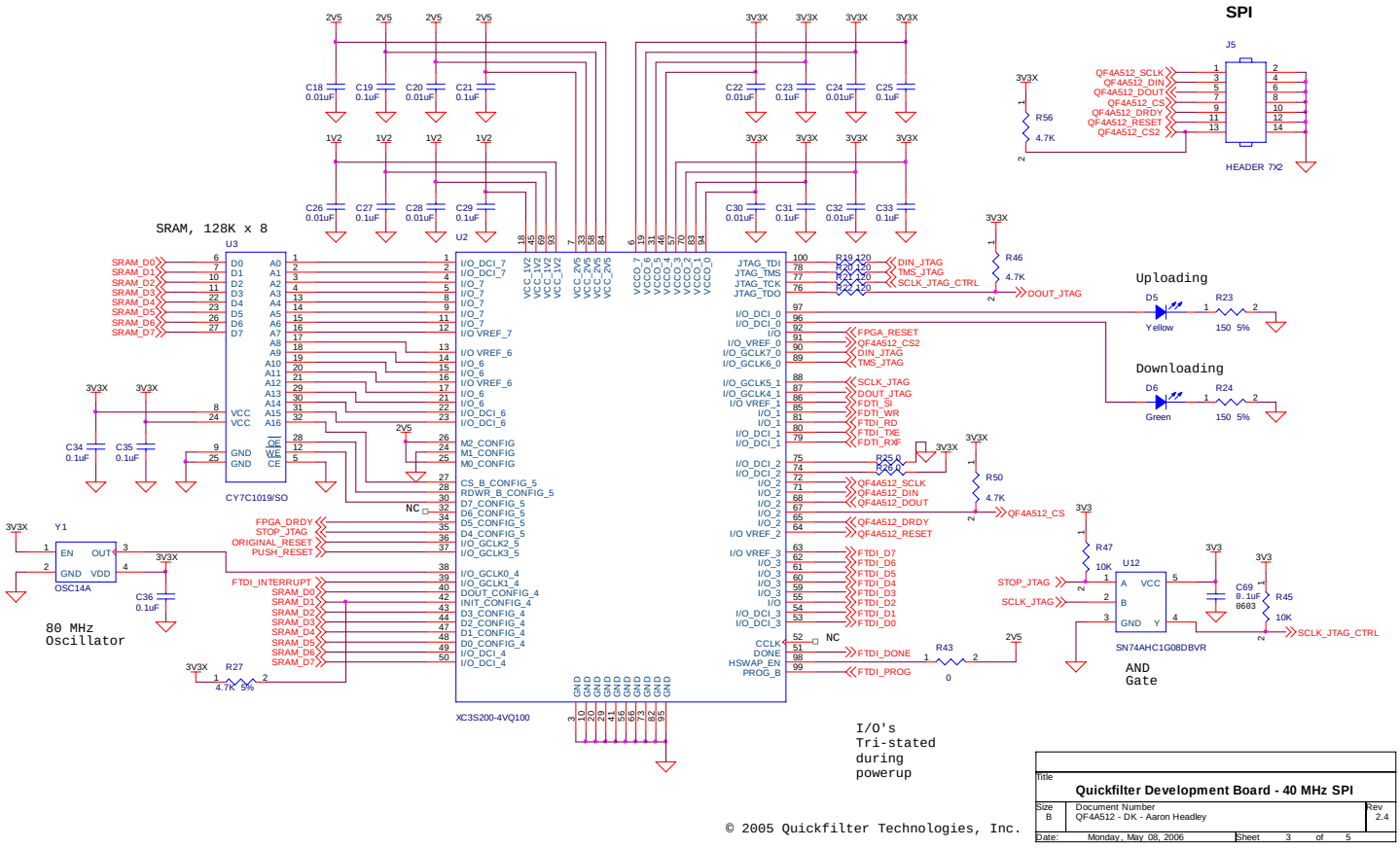
Quickfilter Development Board, QF4A512 - DK



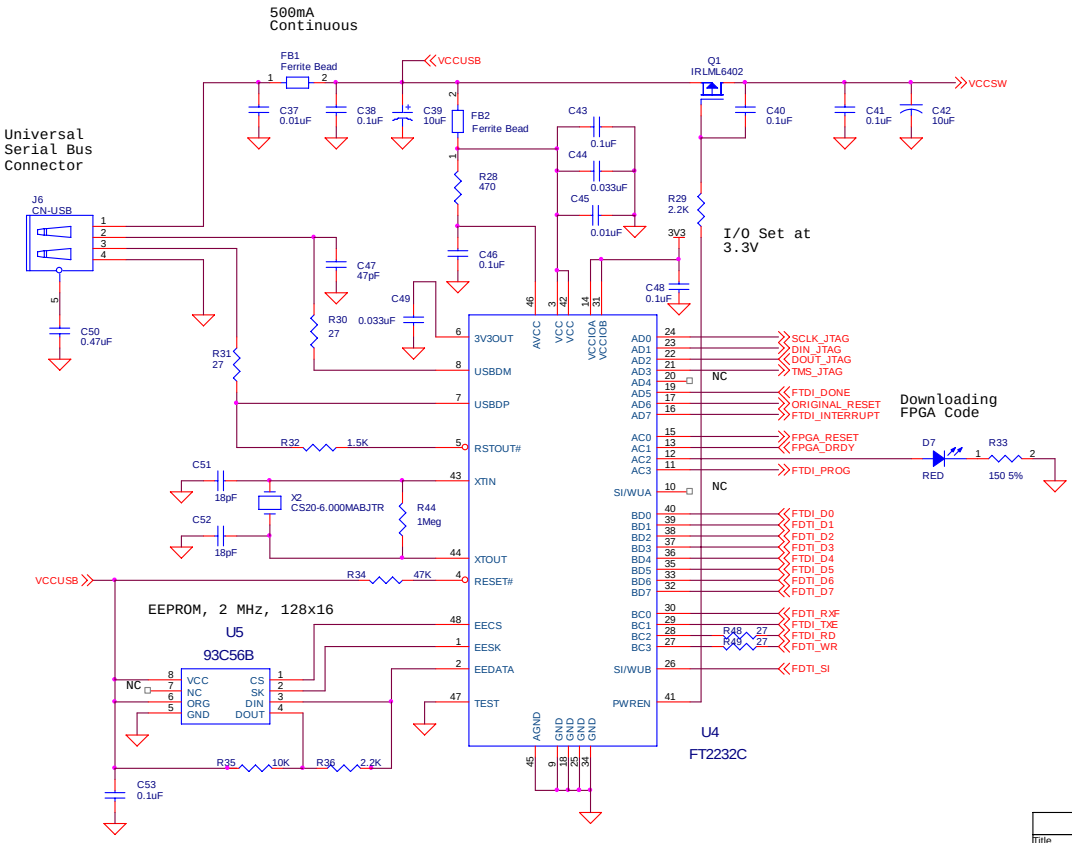
Quickfilter Development Board, QF4A512



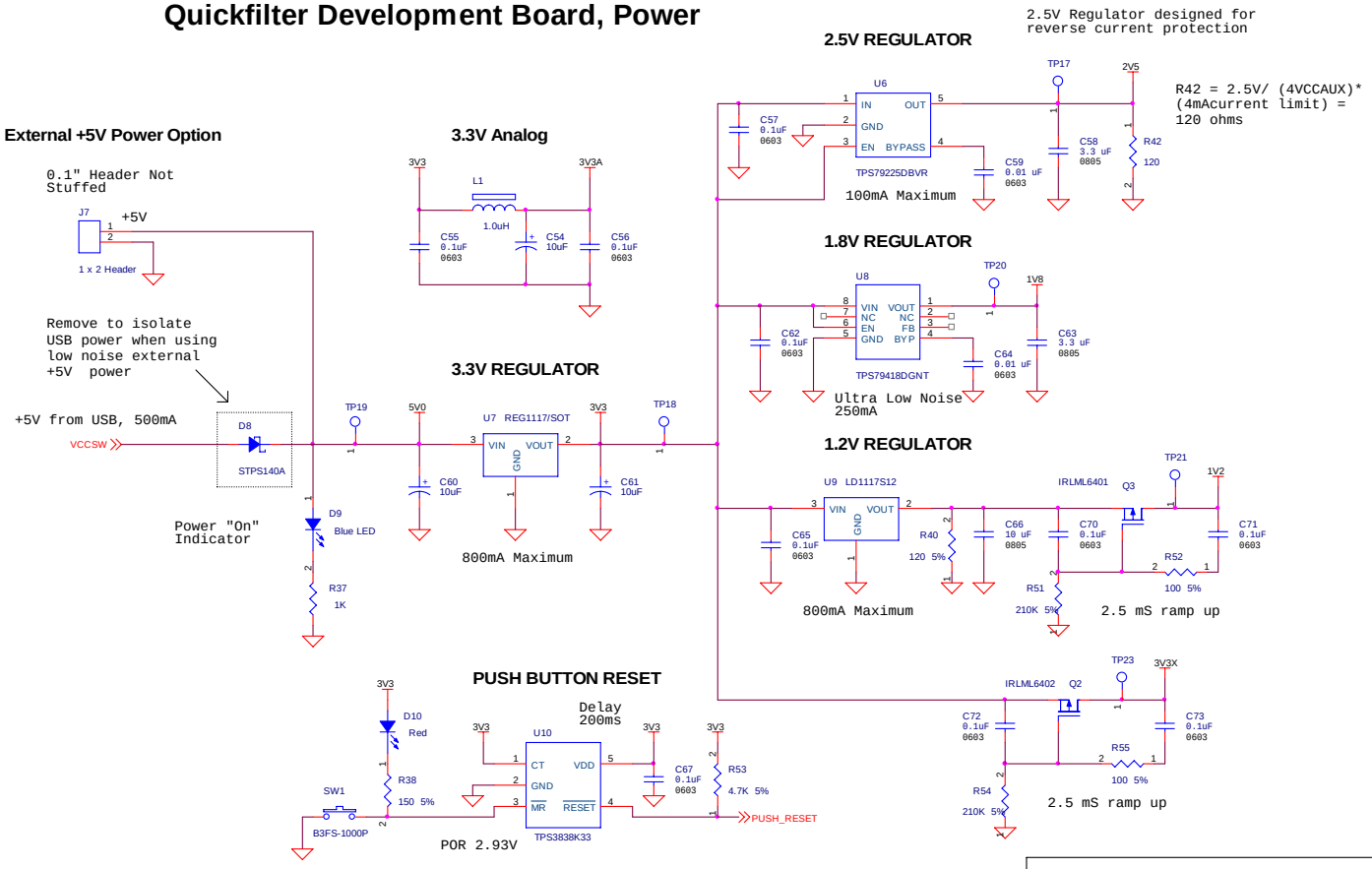
Quickfilter Development Board, 40 MHz SPI Interface



Quickfilter Development Board, USB



Quickfilter Development Board, Power



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