4801 Forbes Blvd, Lanham, MD 20706, 301-552-6300
www.sigmaspace.com

May 22, 2007

Mr. Carlton Lane
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Analog Devices
One Technology Way
PO Box 9106
Norwood, MA 02062-9106

Dear Mr. Lane:

We wanted to take a moment to express our appreciation of the outstanding technical customer support provided by Crispin Metzler on a recent project - the design of a 100-channel imaging lidar instrument. At the front-end of this instrument is a 100-channel photomultiplier tube (PMT) whose outputs have a small amplitude (8mV to 24mV), narrow (<1ns wide) pulsewidth, and fast rise/fall times (200-300ps). Therefore, the front end to our time-of-flight (TOF) electronics card required an amplifier stage immediately followed by fast pulse discrimination. For the pulse discrimination, we chose the Analog Devices ADCMP573 ultrafast comparator device because of its high speed and low dispersion characteristics. Due to signal characteristics as well as the duplication of the 100 channels, the front-end of our TOF card was a concern and posed a design challenge for us.

We certainly did not want to make a miscalculation 100 times, and we initially contacted Crispin early in the project planning stages in August 2005 to discuss potential pitfalls with the ADCMP573 device. From the outset, Crispin provided excellent design techniques and layout strategies to help minimize noise and crosstalk among channels. He also offered to review our PCB layout when we were ready. On our card, the LVPECL output of each ADCMP573 drives the input of an FPGA, and pulse stretching was required in order to ensure that the FPGA could see each of the incoming pulses. Again, we consulted with Crispin on this topic, and he quickly provided sample circuits to help us meet our requirements. We implemented his suggestions with much success, but due to parasitics at the card level, we were not able to meet our pulse-to-pulse requirements, and we eventually ended up choosing a less elegant and more power hungry pulse stretching solution. Nevertheless, Crispin's suggestions and discussions were extremely helpful in providing us with an alternate lower power pulse stretching option.

We built our time-of-flight circuit cards in 2006; each uses 53 ADCMP573 devices (with about half on each side of the card). We use two cards per system so that we have 100 return paths in addition to start signal and spare paths. In the past two weeks, we did some testing of the completed 100-channel imaging lidar instrument. A quick pass through the data indicates good results. We are awaiting a more detailed analysis of the results, but our front-end looks good, and the ADCMP573 devices are working as expected.

Below, we have shown a picture of the top side of the TOF card. You can see a column of 25 ADCMP573 devices on the left side of the card. Most of the other comparators are on the back side of the card. We have also shown a picture of the cards undergoing lab testing and integration steps.

Crispin Metzler went beyond the typical customer/technical support level of service that is normally found at other device manufacturers. He was a great help throughout our design process, and we very much appreciate the time he spent with us on the phone and via e-mail.

Sincerely,

Edward Leventhal

Roman Machan

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Attachments:

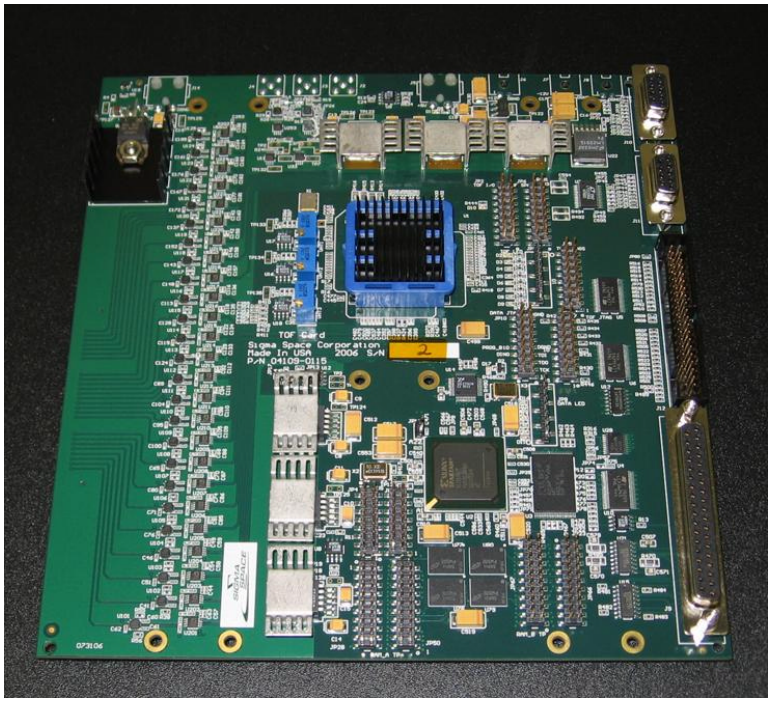

Figure 1: TOF Card (Top Side)

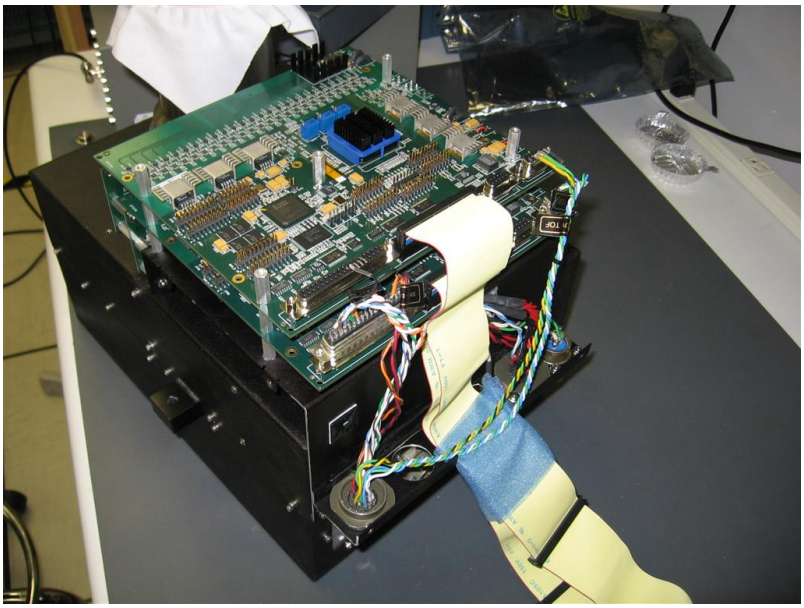

Figure 2: TOF Cards During Testing (Box Cover Off)