Evaluation of Accelerometers

Background:

A wide variety of systems today need to know acceleration, and orientation. Cars use accelerometers and gryros to adjust suspensions, modulate brakes, and control airbag deployment. 3 axis accelerometers and magnetometers are also integrated into most if not all smart phones and tablets. In all cases these devices are MEMs (Micro-Electro-Mechanical) devices, implementing mechanical structures on silicon dies that also have electronics.

Because of the low cost and ubiquity, many companies are looking to use these devices into increasingly sophisticated systems for navigation, stabilization, and guidance systems.

One problem is that the specifications that are important to evaluating a particular devices' importance are not on the manufacturers device data sheet, or are listed as "typical values" without discussing high/low limits, or are just not correct.

This makes choosing what device to use difficult without actually testing the device. If there were a standard board that different devices could be plugged into to evaluate, the design engineers task of selecting a suitable device would be much easier. Since all these devices have different form factors and different pinouts, this is not practical.

However, what is practical is to have a standard board design, with an area dedicated to the device under test, that would allow for a quick respin of the pc board, just changing the area to connect to the device under evaluation, and have this pc board then connect to a PC for data collection and analysis.

Project Details:

This project is to design a small board that will have a microprocessor, power supply, ADC, and communication subsystem and an area that will allow multiple accelerometers to be mounted for performance evaluation. The design should allow for easy modifications in the future to evaluate future devices. Three accelerometers for initial evaluation are from Silicon Sensing Systems, Silicon Devices, and Colibrys.

The microprocessor for the design will be the new Kinesis family single chip microcontroller from Freescale. Freescale has an extensive line of evaluation boards which can be used to jumpstart a design.

The CS student will generate software to read the devices under test, package the data, and send it to a PC via an Ethernet or USB link. The PC should be able to select which device is being read, and at what rate, at a minimum.

The EE student will design the board.

Both students will need to work together to bring up the board and evaluate the data.

Final board layout and fabrication will be done by KVH.

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