SSP1401

MultiChannel LRC Sensor Interface
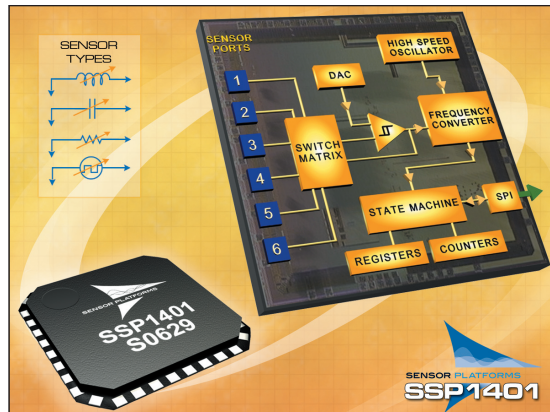### *"Fusion" Interface for micro-power applications*

Lower power!
Fewer components!

The *SSP1401* helps you get products to market faster, cheaper and within your power budget. It's designed for *deeply-embedded*[1] applications, where it needs to measure your sensor, draw minimal current, fit in your product *and* fit in your budget. It works with capacitive, inductive and resistive sensors and can read up to six sensors.

With the SSP1401, sensors are easy.

"The Sensor Platforms SSP1401 provides the technologies that both reduce the cost and time of sensor application development and improve sensor performance."

George Hsu, CEO

The SSP1401 can measure four major types of sensors: pulse count, inductive, capacitive and resistive sensors. Applications included pressure sensors, accelerometers, capacitive touch screens, MR magnetometers, microphones, thermal sensors, to name only a few.

Fusion Interface for Sensors

With its six channels, the SSP1401 can measure six different types of sensors.   This means one can measure two capacitive pressure sensors, two MR sensors and still measure two RTDs, all with one chip.

'Deeply Embedded' design

The SSP1401's frequency-based analog front-end is combined with an ultra-efficient, yet flexible, *deeply embedded* state machine that provides the user with a very high level of control and operating configurability without the additional cost and system overhead required by a general purpose micro-controller (MCU). Such a "deeply embedded" solution is critical in highly cost competitive markets — markets where the sensor industry is gaining significant traction. This is especially true in applications where a high-
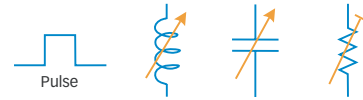
General Description

The SSP1401 has six user-configurable I/O channels that can drive most types of sensor elements including resistive, capacitive, inductive and piezo-resistive varieties. It uses a simple yet powerful measurement technique, akin to a relaxation oscillator, to directly convert sensor values into digital results — without the need for an Analog to Digital Converter (ADC). The technology provides a high level of flexibility and performance while still being extremely cost effective. Measurement times can be kept short and can be adjusted depending on the power budget: short measurements mean less power consumption and longer measurements mean better resolution.

Applications

The SSP1401 is perfectly suited for applications such as: acceleration sensing (L, C or R), pressure sensing (C), magnetometry (R or L), LVDT position and velocity sensing (L), temperature measurement (R), viscometry (C), liquid level sensing (C or R), dielectric measurement (C) or conductivity measurements (R).

Advantages
- 1.8V or 3.3V operation
- Low power consumption: < 0.5mA (typical)
- Large signal-to-noise immunity
- High acquisition resolution (13 bit ENOB)
- Large dynamic range (24 bit counters)

Features
- Operating current < 0.5mA
  (actual value depends on sensor load and sample rate)
- Sleep current < 200uA
- Supply voltage range of 1.6V to 3.6V
- Operating temperature: -40C to +125C
- Available in bare-die or RoHS 28-pin MLF/QFN packages.
- Fully integrated solution requires only 3 discretes plus any sensor components.
- SPI digital serial data communication
- Drives and measures sensors
- Measurement technique is similar to a relaxation oscillator and uses LR or RC networks. Adjustable DACs allow independent adjustment of high and low voltage swings — allowing bias adjustment on each sensor.
- Internal or external clock; higher frequencies lead to improved resolution and shorter sampling time.
- All chip functions and settings are controllable from the serial interface using a register-based architecture.
- Count-up and subtract-down option for back-to-front sensor measurements.

[1]*Deeply embedded products are less reconfigurable than microcontrollers, but smaller and cheaper and designed to fill a specific product niche perfectly.*
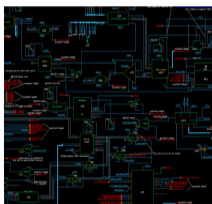
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level of code-based reconfigurability is less important than lower costs. In many cases, a full-blown micro-controller is overkill, whereas a deeply embedded solution is just right.

Digital SPI Access

All communication takes place over the SPI bus. For example, to measure a given sensor: a measurement request would be sent via the SPI bus, the state machine and analog block would be turned on, the sensor measured, the results stored in a register for later retrieval and all non-SPI functions returned to sleep. Measurement completion is indicated by both a status register as well as a data ready pin, which can function as an interrupt trigger.

Hardware Development Kit

The development kit for the SSP1401 comes with everything needed to get started quickly. A simple touch-screen demo demonstrates the capabilities of the chip. Its a great way to get up and running quickly with the SSP1401.

- USB interface communications board using an ARM7 with 256K of code space.
- SSP1401 Acquisition board with breakout ports
- Sensor board with six button capacitive touch screen
- Eclipse-based Integrated Development Environment (IDE), Data acquisition and control software System Analysis Tools.
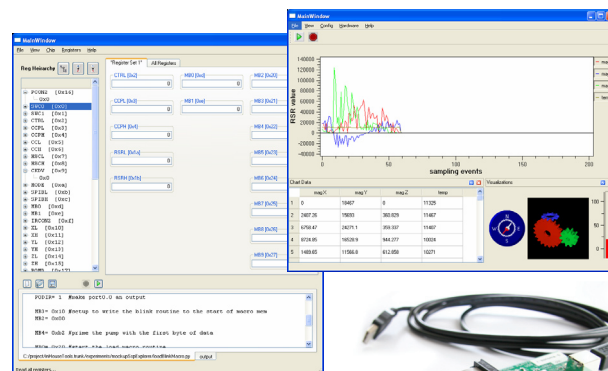
SSP1401 Development Platform
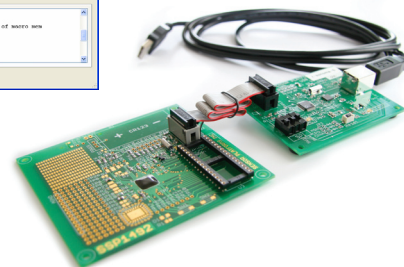
Sensor Platforms, Inc.

SPI is a fabless semiconductor company, located in San Jose, California, that provides standard and custom mixed signal IC solutions to sensor manufacturers and system integrators. We are unique because we understand the needs of the interface IC not only from a mixed signal IC perspective, but also from the level of the system and the sensor. Our unique combination of expertise in mixed-signal analog IC design, sensor knowledge, and system level application requirements enable us to add value at each stage of sensor application deployment, from sensor specific analog blocks to DSP and algorithm engines to embedded firmware.
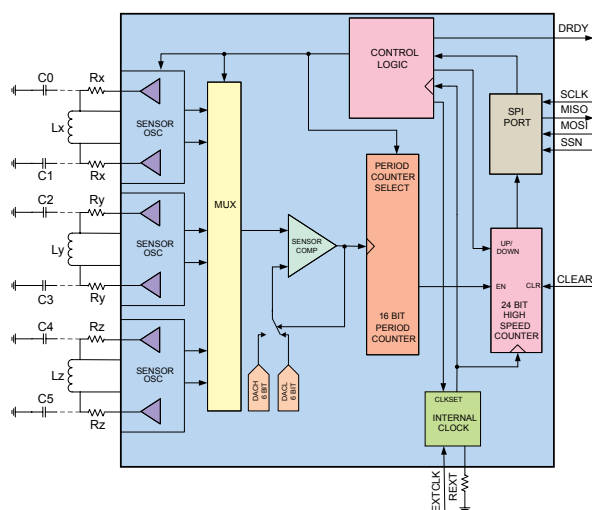
Basic block diagram for the SSP1401 showing connection to either capacitive sensors (C0 to C5) or to inductive sensors (Lx, Ly and Lz).
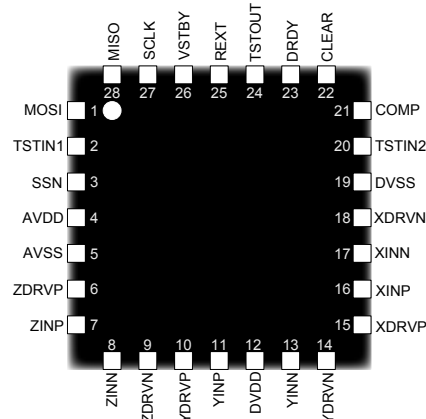
Pin out diagram for 28 pin MLF/QFN.