

Application brief

Wireless pressure sensing

Measure the pressure in all the right places with the XENSIV™ pressure sensor with integrated microcontroller

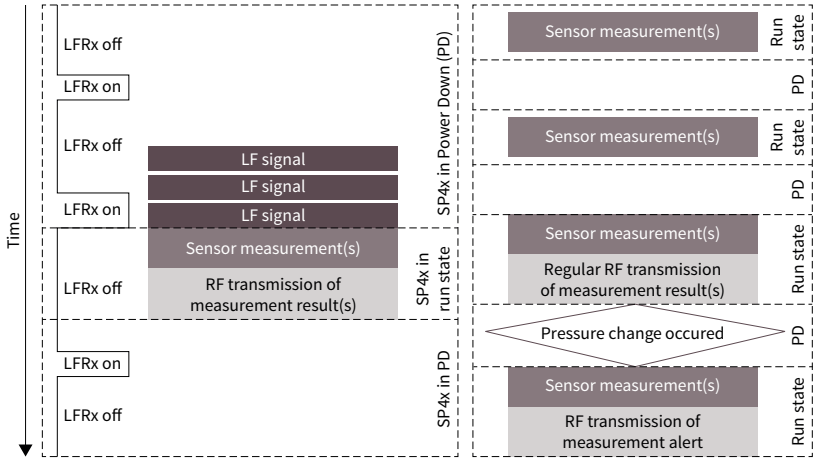
In some applications it is difficult to install a sensor at the place where it would be most valuable, simply because routing the necessary wires is not possible. If you consider for example measuring the pressure in a car tire, a bicycle or an E-Scooter: Routing the wires from the vehicle through the rubber of the rotating tires most certainly is not a viable solution.

In other cases the wiring would pose an annoying obstacle when removing or replacing parts, especially if it happens very frequently: Imagine a van with removable seats that feature occupant detection. If the driver has to plug back in wires every time the seats are replaced, he or she might just stop doing it at some point and the occupant detection would be useless.

The solution to these problems are battery operated, wireless sensors. Infineon's SP40 family offers pressure sensors optimized for the use in locations, where wired sensors are not feasible. Beside their low power consumption and integrated microcontroller SP40 products also feature an RF transmitter and an LF receiver. This makes them ideal for battery powered wireless sensor solutions.

The RF transmitter can operate in the 315 MHz and 434 MHz band with baud rates of up to 20 kbit/s. Data can be transmitted using ASK, FSK or GFSK modulation and various encoding schemes, including for example Manchester encoding to improve robustness of the RF link.

Exemplary application flows for on-demand (left) and scheduled (right) measurements



System features

- Warn when operating conditions are out of optimal range
- Avoid damage or increased degradation due to wrong pressure or temperature

System benefits

- Flexible placement
- No wiring needed
- Long battery lifetime
- Optimized system costs due to high level of integration

SP40 key features

- Integrated industry-standard 8-bit microcontroller
- Integrated RF transmitter operating at 315 MHz or 434 MHz
- Integrated LF receiver operating at 125 kHz
- Integrated temperature compensated pressure sensor
- Integrated acceleration sensor
- Integrated low-power timer with wake-up capability
- Suitable for automotive and industrial applications

www.infineon.com/tpms-sensors

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The LF receiver operating at 125 kHz draws only a few µA of current and can be used in a duty cycled mode. This allows the sensor to wake-up to either an LF carrier or ASK modulated telegram with short latency.

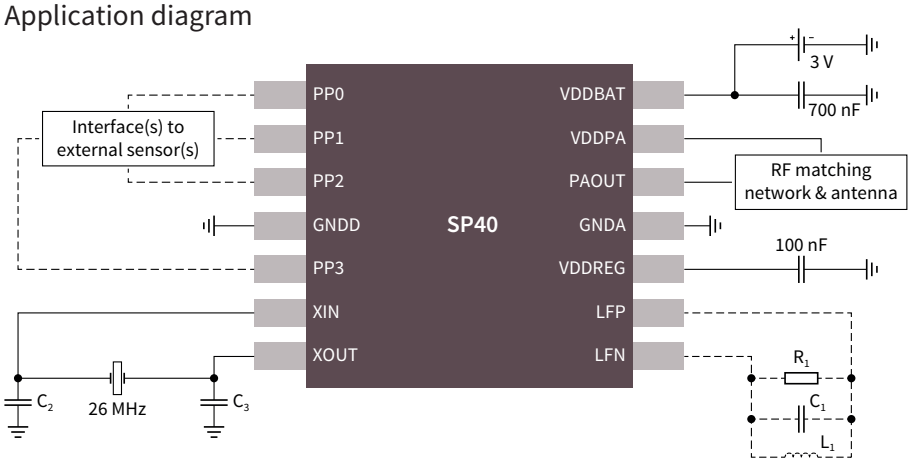
In addition to the possibility to activate the sensor via LF, it is also possible to operate the SP40 products in a stand-alone manner. Thanks to the programmable low-power timer, the sensor can wake-up regularly to perform pressure measurements and transmit the results.

Finally, SP40 features an acceleration sensor with a sampling rate of up to 2 kHz that can be used to measure static acceleration or vibrations. Such measurements can be helpful for diagnostics or to pre-emptively detect failures. It can also help to reduce charge consumption, if RF transmission are needed only if the acceleration exceeds a certain threshold.

Additional external sensors can also be used, if needed. For this, the four programmable GPIOs of the SP40 products can be used as digital interfaces like SPI, UART or I^2C.

In wired applications, SP40 products can also be used as efficient pressure sensors without the usage of the RF transmitter and LF receiver. Learn more in our application brief “Efficient pressure sensing” available for download at www.infineon.com/tpms-sensors

Application diagram



Blocks that can be removed, if not required by the application, are shown with dashed lines.

The values of C1, R1 and L1 depend on the application’s requirements for the LF sensitivity. The values of C2 and C3 depend on the used crystal.

Available product derivatives

Sales code	Short product name	Pressure range [kPa]	Flash available for application code
SP400-11-01	SP40PLUS	100 … 900	12 kB, not fragmented
SP400-11-11	SP40PLUS XCS	100 … 900	12 kB + 2 kB, fragmented
SP400-15-11	SP40T	100 … 1.400	12 kB + 2 kB, fragmented

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