Sensing Solutions—Robust, Reliable Performance
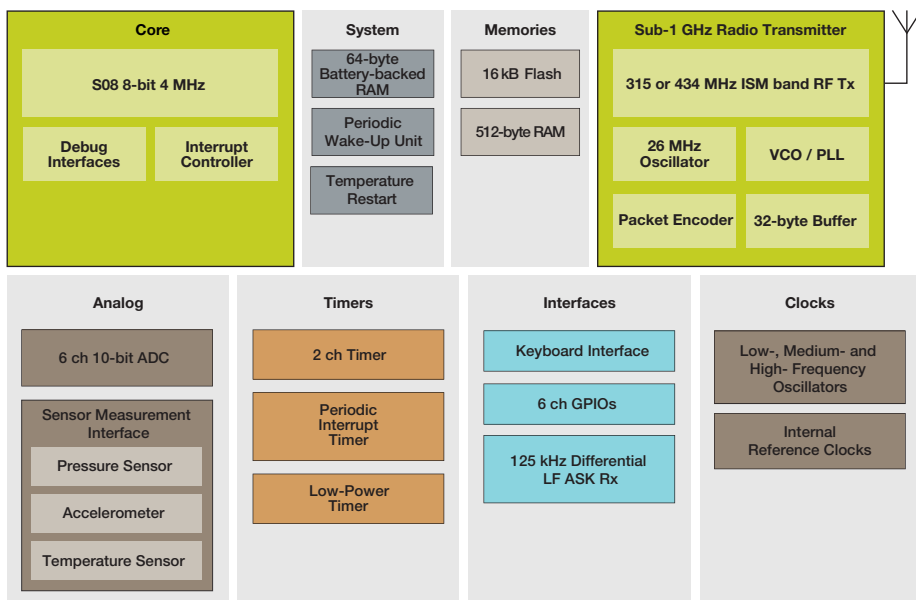
FXTH870x TPMS Family

Tire Pressure Monitoring Sensors 100-900 kPa

Overview

Freescale's FXTH870s family of tire pressure monitoring sensors (TPMS) is the smallest, fully integrated 7 x 7 mm package footprint on the market which is 40% smaller than Freescale's previous-generation QFN 9 x 9 mm package. It also provides the lowest transmitting power consumption (less than 8 mA Idd), largest customer memory size (8 kB) and unique dual-axis accelerometer architecture. Freescale's TPMS solution integrates an 8-bit microcontroller (MCU), pressure sensor, XZ-axis or Z-axis accelerometer and RF transmitter.

Freescale's portfolio with pressure ranges of 100-450 kPa and 100–900 kPa support cars and light trucks TPMS markets. These TPMS markets are mainly regulation driven with new mandates, resulting in significant growth. Freescale continues to produce TPMS products that meet the latest mandates with ease to accommodate customer requirements.
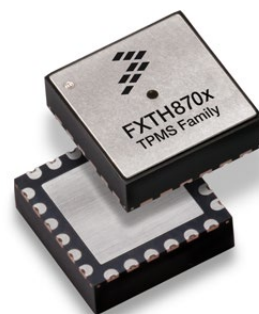
Target Applications

- Tire pressure monitoring systems
- Ultra low-power wireless sensing

Implementations

- Measures pressure for passenger/light duty vehicles
- Measures dual-axis acceleration
- Measures temperature
- Measures battery voltage
- Bi-directional communication

FXTH870x TPMS Family Block Diagram

Core	System	Memories	Sub-1 GHz Radio Transmitter
S08 8-bit 4 MHz	64-byte Battery-backed RAM	16 kB Flash	315 or 434 MHz ISM band RF Tx
Debug Interfaces / Interrupt Controller	Periodic Wake-Up Unit	512-byte RAM	26 MHz Oscillator / VCO / PLL
	Temperature Restart		Packet Encoder / 32-byte Buffer

Analog	Timers	Interfaces	Clocks
6 ch 10-bit ADC	2 ch Timer	Keyboard Interface	Low-, Medium- and High- Frequency Oscillators
Sensor Measurement Interface	Periodic Interrupt Timer	6 ch GPIOs	Internal Reference Clocks
Pressure Sensor	Low-Power Timer	125 kHz Differential LF ASK Rx	
Accelerometer			
Temperature Sensor			

Product Specifications

Standard Part Number	P-cell Range (kPa)	Pressure Offset Accuracy (0° C to 70° C)	Axis of Acceleration	Z Range	Z-Offset Accuracy (-40° C to +125° C)	X Range	X-Offset Accuracy (-40° C to +125° C)
Standard Tolerances							
FXTH870502DT1	100–450	±7 kPa	Z	-270 g/+ 400 g range	±6 g		
FXTH870511DT1	100–450	±7 kPa	XZ	-210 g/+240 g range	±5 g	-80 g/+90 g range	±4 g
FXTH870902DT1	100–900	± 10 kPa	Z	-270 g/+ 400 g range	±6 g		
FXTH870911DT1	100–900	± 10 kPa	XZ	-210 g/+240 g range	±5 g	-80 g/+90 g range	±4 g
FXTH870912DT1	100–900	± 10 kPa	XZ	-270 g/+ 400 g range	±6 g	-80 g/+90 g range	±4 g
Precision Tolerances							
FXTH8705026T1	100–450	± 7 kPa	Z	-270 g/+ 400 g range	±3 g		
FXTH8705116T1	100–450	±7 kPa	XZ	-210 g/+240 g range	±3 g	-80 g/+90 g range	±3 g
FXTH8709026T1	100–900	± 10 kPa	Z	-270 g/+ 400 g range	±3 g		
FXTH8709116T1	100–900	± 10 kPa	XZ	-210 g/+240 g range	±3 g	-80 g/+90 g range	±3 g
FXTH8709126T1	100–900	± 10 kPa	XZ	-270 g/+ 400 g range	±3 g	-80 g/+90 g range	±3 g

* For precision product availability, please contact your Freescale Sales Representative.

Features

- QFN 7 x 7 x 2.2 mm package enables visible solder joint for inspection
- 100–450 kPa and 100–900 kPa pressure ranges
- Z-axis or dual XZ-axis accelerometers
- Accelerometer standard or precision tolerances available
- Low-power wake-up timer and periodic reset driven by LFO
- Dedicated state machines for reduced power consumption
- 8-bit MCU/S08 core with SIM, interrupt and debug/monitor
- 512 Bytes RAM / 16 k Flash (8 k for Freescale library, 8 k for applications)
- Internal 315/434 MHz RF transmitter
- Internal 125 kHz LF receiver
- Six multipurpose GPIO pins (including two A/D inputs)

Product Longevity Program

These products are/or may be supported by Freescale's Product Longevity Program. For Terms and Conditions and to obtain a list of available products please see: **Freescale.com/productlongevity**

Common Attributes

Voltage Measurement Range	1.8 V to 3.6 V
Voltage Resolution (8-bit)	10 mV / LSB
Voltage Accuracy (>2.1 V supply)	±100 mV
Temperature Measurement Range Run Mode	-40 °C to +125 °C
Temperature Resolution (8-bit unsigned)	1 °C / LSB
Temperature Offset Accuracy (-20 °C ≤ TA ≤ 70 °C)	±3 °C

Product Differentiation

Features	Benefits
Smallest, fully integrated package size	Enables smallest module design for lighter weight and space-constrained applications
Dual-axis XZ inertial sensor	Enables easier tire localization capability
Same package height and similar firmware as QFN 9 x 9 solutions	Easy transition from QFN 9 x 9 solutions
8 kB customer memory/capability of interfacing with external memory	Flexibility of software development and time to market
Lowest RF power consumption	Longest battery life
High production capacity (QFN 7 x 7)	Secured supply and short lead time

Documentation

Document Number	Title	Description
FXTH870xD	Tire Pressure Monitor System Standard Tolerance Specification	Data Sheet
FXTH870x6	Tire Pressure Monitor System Precision Tolerance Specification	Data Sheet
AN4391	Using the FXTH87 Family of LF Receivers for TPMS Application	Application Note
AN1902	Assembly Guidelines for QFN and DFN Packages	Application Note

Freescale: A Leader in Sensing Solutions

Expanding on more than 35 years of sensor innovation, Freescale sensing solutions are designed with the right combination of high-performance sensing capability, processing capacity and customizable software to help deliver smart, differentiated sensing applications. With these sensing solutions, our vision is to offer a diverse and differentiated product portfolio to meet the expanding needs of the automotive, consumer and industrial segments. Freescale sensing solutions offer ideal blends of functionality and intelligence designed to help our customers differentiate and win in highly competitive market.

For more information, visit freescale.com/TPMS

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