



PRODUCT DESIGN DESCRIPTION

MICRO.SP TPMS SENSOR

DATASHEET

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Change History

Revision	Date	Description of Changes
00	2020/10/14	First release of the document



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1 Scope

This document is intended to describe the features and specifications of TPMS Sensor VEX1712.

2 Definitions

RF Radio Frequency

TPMS Tire Pressure Monitoring System

3 References

- [1] PDD-EN000005 Micro.sp TPMS Sensor State Machine Specification
- [2] Micro.sp Protocol Specification v1.9
- [3] ICD-EN000004 VEX1712 Parameter Table

4 Family variants

The product is available in the following versions, which share the same circuit and valve core and differ only from the mechanical point of view:

- 1) VEX1712S1 Tire pressure measure transmitter - Standard version
- 2) VEX1712OTR1 Off-road vehicle version
- 3) VEX1712EXT1 Rubber tube extended version
- 4) VEX1712EXT2 Rubber tube extra-extended version

5 Product Description

VEX1712 is a very small form factor TPMS sensor to be equipped on standard tubeless tire valves, designed for application on trucks, trailers, buses and other commercial vehicles with rim size 17.5" and above. It measures the air pressure of the tire, temperature and battery voltage level and transmits these data through radio interface (434MHz license-free ISM band), with proprietary Micro.sp® technology.



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The core of the circuit is the low power system in package MLX91804 from Melexis, which integrates 16-bit microcontroller, pressure sensor, accelerometer and RF transmitter.

The Wheatstone bridge piezoresistive absolute pressure sensor is placed on a separate die under a hole of the case and protected by a special chemical resistant gel. Nominal absolute pressure range is 100 -1400 KPa and accuracy is ± 4 kPa.

The accelerometer measures acceleration over x, y and z axes and is used to determine whether the vehicle is moving or parked.

The device has different operative states. From production, the device is set into Inactive state and does not transmit data. When pressure is above a determined threshold, the device enters Active state and transmits data periodically (currently set at 7s intervals).

NOTE: Optionally (if required for future application), when in Active state, the device may enter Parked state after a determined time interval in which acceleration level is zero, and in this state it transmits data with a different transmission interval (typically one transmission per minute), thus reducing overall power consumption and increasing battery lifetime.

Also, when both acceleration and relative pressure sampling return zero for a determined time interval (set at 1 day), meaning that the device is not installed on any tire, the sensor goes back into Inactive state and stops transmitting until reactivated again.

Powered by a standard BR1225 lithium battery, it can guarantee a lifetime of at least 3 years.

5.1 Technical Specifications

Name	Value
Pressure Range (1)	0 – 13 bar (1300 kPa)
Overpressure (1)	19 bar (1 minute)
Operating Temperature	-40 +85 °C
Storage Temperature	-40 +85 °C
Measurement Sampling and TX Period Time	7 seconds (Typ.)
Current consumption during transmission	1,295 μ A (average over 6ms transmission time)
Current consumption during sleep mode	91nA
Battery type	BR1225 (48mAh)
Expected Life (2)	OPERATING MODE: 3 years
EXPECTED LIFE REDUCTION IN “0 Bar SLEEP MODE “	20% less/OP-MODE/Year

Note 1: Relative Pressure.

Note 2: Battery life varies according to the operating temperature.



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5.2 RF Specifications

Compliant to ETSI EN 300 220-1 v3.1.1(2017-02) - EN 300 220-2 v3.2.1(2018-06), FCC part 15.231.

CEPT ERC REC 70-03: Annex 1, Freq. Band f1.

Parameter	Conditions	Specification			Unit
		Min	Typ	Max	
Frequency	20 °C		434,2		MHz
Frequency Error (1)	-40 ÷ +85°C	434,1		434,4	MHz
MODULATION BANDWIDTH (-20 dBc) (2)	-20 ÷ +60 °C	433,9		434,5	MHz
MODULATION BANDWIDTH (-6 dBc)			300		kHz
Effective Radiated Power	20 °C		-36		dBm
Spurious Emission	RBW=100kHz			-40	dBm
Duty Cycle			0,05%		
Transmission Period Time	-40 ÷ +85°C	10	11		s
Emi Protection (EN 301 489-3)					
1) RF EM Field			30 V/m		

Note 1: Measured as the midpoint of the emission spectrum bandwidth.

Note 2: Frequency of the -20dBc (dB under the erp peak power) points of the emission spectrum measured under the extreme test conditions (temperature and source voltage). The limits are comprehensive of the frequency error and drift (EN 300 220-1 clause 7.7).

5.3 Measurement Performance Specifications

5.3.1 Pressure measurement

The reported performance reflects the use of a 10-bit measurement.

Computation and temperature compensation to obtain the reported performance are performed on the receiver side.

PARAMETER	TEMPERATURE	SPECIFICATION			UNIT
		MIN.	TYP.	MAX	
Pressure Range (1)	-40 ÷ +85°C	0		1300	kPa
Measurement Resolution	-40 ÷ +85°C	±4			kPa
Measurement Error (1)					
1) 0 bar to 10 bar	-40 ÷ +85°C			±10	kPa
2) 0 bar to 13 bar	0 ÷ +70°C			±20	kPa
3) 0 bar to 13 bar	-40 ÷ +85°C			±30	kPa

Note 1: Relative Pressure



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5.3.2 Temperature measurement

The reported performance reflects the use of a 10-bit measurement (25 °C calibrated) and an 8-bit resolution transmitted message.

PARAMETER	MIN	TYP	MAX
Temperature Range	-40 °C		+85 °C
Measurement Error			
1) -40 to +10 °C		±4.6°C	±7°C
2) +10 to +70 °C			±3°C
3) +70 to +85 °C			±4°C

5.3.3 Battery voltage measurement

Battery voltage measurement is encoded with 2 bits, as reported in the table below.

Value (binary)	Explanation
1 1	Battery Voltage \geq 2,9 V
1 0	2,6 V \leq Battery Voltage < 2,9 V
0 1	2,3 V \leq Battery Voltage < 2,6 V
0 0	Battery Voltage < 2,3 V
MEASUREMENT ERROR (-40 to +85 °C) \pm 0,1 V	

5.4 Mechanical Specifications

VEX1712S1	
DIMENSIONS (without plastic cap)	40 x 23 x 20,5mm
WEIGHT	30g

VEX1712OTR1	
DIMENSIONS (without plastic cap)	52 x 20,25 x 20,5mm
WEIGHT	55g

VEX1712EXT1	
DIMENSIONS (without plastic cap)	152 x 29 x 20,5mm
WEIGHT	40g

VEX1712EXT2	
DIMENSIONS (without plastic cap)	235 x 21,6 x 20,5mm
WEIGHT	55g



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6 Installation

Product installation consists in screwing the sensor tightly to the tire valve stem. The transmitter will activate itself automatically when a pressure higher than the threshold is detected.

For best RF transmitter performance, rotate the product until the plastic cap is oriented towards the exterior of the tire.

7 Safety information

Installation should preferably be performed either indoor or in protected outdoor environment, avoiding extreme temperatures and other extreme environmental conditions.

Sensors must be only fitted to undamaged valves which have clean screw threads onto which the sensor can attach. The valve core pin should sit no more than 1mm below the valve body so that the sensor can depress it on attachment. If not, the valve core must be either unscrewed or preferably replaced.

Do not install the product on a vehicle when the engine is running. Place a visual warning that someone is working on the vehicle to alert the driver and inform him/her not to start the vehicle.

Do not try to open the product or replace the battery.

At the end of life, the product must be disposed according to the local regulation for electrical and electronic assemblies.

8 FCC Warnings

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.



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— Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

— Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and a human body.



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