Oak P
Pressure and Temperature Sensor

Datasheet
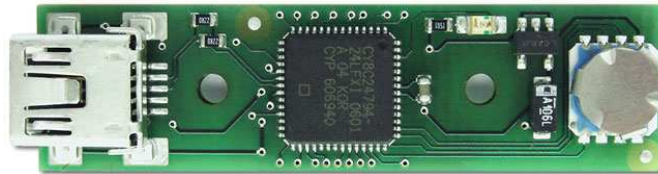
Revision history

Date	Doc. Rev.	Changes
21-Jun-2011	Rev. 1.8	Disclaimer Update
21-Mar-2011	Rev. 1.7	Changed units of temperature resolution and accuracy
22-Feb-2011	Rev. 1.6	Added note about accuracy of temperature measurement
17-Jan-2011	Rev. 1.5	Modified Sample Rate Range
29-Oct-2010	Rev. 1.4	Added Operating Temperature Range
30-Sep-2010	Rev. 1.3	Added USB Vendor ID and Product ID
05-Jun-2009	Rev. 1.2	Fixed temperature unit exponent in Interrupt In report
29-Feb-2008	Rev. 1.1	Minor Edits (section 1.1)
23-Mar-2007	Rev. 1.0	Initial Release

Contents

1. Introduction

The Oak P is a USB attached precision piezoresistive pressure sensor. The on-chip calibration and analog to digital converter ensures highest precision and excellent signal quality. In altimeter applications the device's resolution is in the range of 0.5 meters.

The Oak P can be integrated in a custom application very easily. The operating power as well as real time sensor data and uncritical sensor configuration data are all transferred through a simple USB cable. The very low power consumption, including automatic entering into sleep mode, allows using the device not only in fixed installations, but also in mobile applications.

1.1   Reference Documents

Sensor Datasheet:
http://files.toradex.com/Oak/Datasheets/Components/Oak_P/amsys.de.ms5540_e.pdf

Programming Guide for the Oak Sensor Family:
http://files.toradex.com/Oak/Oak_ProgrammingGuide.pdf

Oak Programming Tutorial for Windows:
http://wiki.toradex.com/index.php/Oak_Programming_Tutorial_for_Windows

2. Hardware Specifications

2.1 Sensor: Intersema MS5540B

The MS5540B is a SMD-hybrid device including a precision piezoresistive pressure sensor and an ADC Interface IC. Amongst other application the device fits very well in altimeter/barometer devices as well as weather control stations.

2.2 Measurement Range

Pressure: 1 - 110 kPa   (10 - 1100 mbar, 0.0147 – 16.17 PSI)
            Resolution: 10 Pa   (0.1 mbar, 0.000147 PSI)

Temperature: -10 to 85 °C (limited by operating temperature range, see paragraph 2.5)
            Resolution: 0.015 °C
            Accuracy: ±2 °C

Note: Toradex does not recommend using the sensor for precise temperature measurements, as the accuracy is significantly reduced due to self-heating by the microcontroller.

For more details, please refer to the sensor datasheet (link in chapter 1.1)

2.3 Supported Sensor Features

Read pressure

Read temperature

Sample rate adjustable

2.4 USB Interface

Interface: USB 2.0 Full Speed (12Mbit/s)

Connector: Standard USB Mini-B

Device Class: HID

Vendor ID: 0x1B67

Product ID: 0x0002

Sampling Rate: 67ms to 65s, user adjustable

Report Rate: 1ms to 65s, user adjustable

2.5 Operating Temperature Range

Minimum Operating Temperature: -10 °C

Maximum Operating Temperature: +85 °C

3. Software Specifications

All Oak Sensors are implemented as HID devices. Thus driver support is built into all major operating systems.

Captured sensor Data is transmitted through an INTERRUPT IN reports. Therefore real time processing can be guaranteed. This data can be received by the host using regular file read operations. Chapter 3.1 describes the contents of this report.

On an independent communication channel, sensor configuration is done using FEATURE reports that are 32 Bytes in length. Special operating system calls exist to transmit / receive feature reports. Chapter 3.2 shows the structure of a feature report for each supported command.

Please refer also to the document "Programming Guide to the Oak Sensor Family" for more details.

3.1 INTERRUPT IN Report Contents (Real time data)

16 Bit	Frame Number	10^{-3}	s
16 Bit	Pressure	10^{1}	Pa
16 Bit	Temperature	10^{-1}	K

3.2 FEATURE Report Commands

3.2.1 Report Mode

Byte#	0	1	2	3	4	5
Content	GnS	Tgt	0x01	0x00	0x00	RPTMODE

GnS: 0 = Set
 1 = Get

Tgt 0 = RAM
 1 = Flash

RPTMODE: 0 = After Sampling (Factory Default)
 1 = After Change
 2 = Fixed Rate

3.2.2 LED Mode

Byte#	0	1	2	3	4	5
Content	GnS	Tgt	0x01	0x01	0x00	LEDMODE

GnS: 0 = Set
 1 = Get

Tgt 0 = RAM
 1 = Flash

LEDMODE: 0 = Off (Factory Default)
 1 = On
 2 = Blink Slowly
 3 = Blink Fast
 4 = Blink 4 pulses

3.2.3 Report Rate

Number of milliseconds between two IN reports. This parameter will only be regarded if Report Mode = 2 (fixed rate)

Byte#	0	1	2	3	4	5	6
Content	GnS	Tgt	0x02	0x00	0x00	RptRate LSB	RptRate MSB

GnS: 0 = Set
            1 = Get

Tgt   0 = RAM
            1 = Flash

RptRate: Report Rate [ms]

3.2.4 Sample Rate

This is the actual sample rate the sensor is working on. If Report Mode = 0 (After Sampling) this is also the rate at which the device reports values to the host PC.

Byte#	0	1	2	3	4	5	6
Content	GnS	Tgt	0x02	0x01	0x00	SampRate LSB	SampRate MSB

GnS: 0 = Set
            1 = Get

Tgt   0 = RAM
            1 = Flash

SampRate: Sample Rate [ms]

3.2.5 User Device Name

Byte#	0	1	2	3	4	5-25
Content	GnS	Tgt	0x15	0x00	0x00	UsrDevName

GnS: 0 = Set
            1 = Get

Tgt   0 = RAM
            1 = Flash

UsrDevName: User defined name for the whole device
            Null-terminated string, max. 20+1 characters

3.2.6 User Channel Name

Byte#	0	1	2	3	4	5-25
Content	GnS	Tgt	0x15	ChP1	0x00	UsrChName

GnS: 0 = Set
            1 = Get

Tgt   0 = RAM
            1 = Flash

ChP1   1 = Channel 0 (Frame Number)
            2 = Channel 1 (Pressure)
            3 = Channel 2 (Temperature)

UsrChName: User defined name for the channel
            Null-terminated string, max. 20+1 characters

4. Technical Specifications

4.1 Current Consumption

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_q [1]	Operating current				20	mA
I_{Stby}	Standby current	No USB activity			500	µA

[1] The maximum operating current is mainly influenced by the on board LED.

4.2 Mechanical Dimensions

The PCB is designed to be mounted using two standard M2 screws. There are no components on the back side of the PCB.
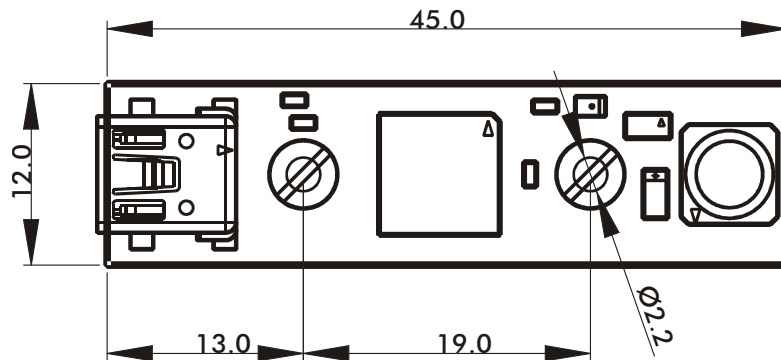
Figure 1: Mechanical dimensions of the Oak P sensor

4.3 RoHS Compliance

Unless otherwise stated, all Toradex products comply with the European Union's Directive 2002/95/EC: "Restrictions of Hazardous Substances".

Disclaimer: