Oak TC

2 Channels Thermocouple Sensor

Datasheet

Include picture of Oak TC

Contents

1. Introduction

The Oak TC is a USB attached precision 2 Channel Thermocouple sensor. It is designed for measuring a wide range of temperatures. The cold junction is located between the Thermocouple, so it is easy to use one Thermocouple as reverence temperature.

The Oak TC 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

Cold junction Sensor

http://cache.national.com/ds/LM/LM73.pdf

Programming Guide to the Oak Sensor Family

2. Hardware Specifications

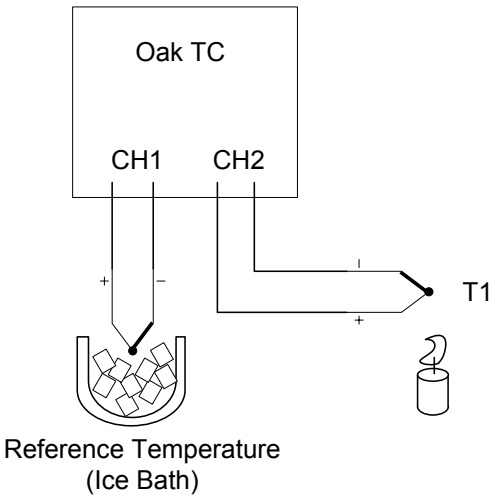
2.1 Temperature Measurement

The temperature is measured by using the Seebeck effect, this effect describes the conversion of temperature and voltage of a thermocouple.

The Thermoelectric Voltage of the Thermocouple is measured by using a 16 bit A to D converter. The temperature is now calculated with look-up tables and the temperature of the cold junction.

2.2 Example of use

Zuerst Beispiel machen mit 2 Temperaturen zu messen, dann dieses Beispiel



This example shows how to get a better measurement result, by removing the fault of the cold junction between the two thermocouples. Put the junction of Channel 1 in an Ice Bath, forcing the temperature of Channel 1 to 0°C.

The temperature T1 is now: T1 = CH2 – CH1

This method is very accurate because, the ice point temperature can be precisely controlled. Of course with this method only one temperature can be measured.

2.3 Pin Assignment

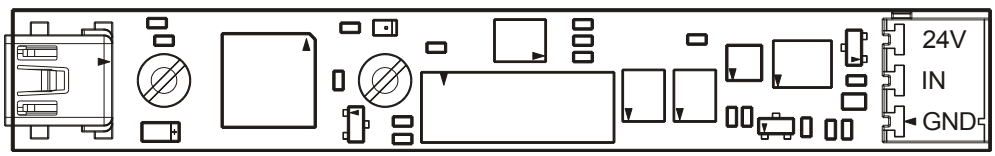


Figure 1: Pin assignment Richtiges Bild einfügen

2.4 Measurement Range

Sensor data are provided in Kelvin:

Liste anghängen mit den unterstützten Temperaturbereichen von den verschiedenen Thermocouple Sensorelementen

Temperature Cold junction: Range: -10°C to 80°C ±1.0°C (max)

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

Temperature Thermocouple: depends on the used Thermocouple Type, supported Types are K, J, T, R

2.5 Supported Sensor Features

Read temperatures in Kelvin

Sample rate adjustable

2.6 USB Interface

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

Connector: Standard USB Mini-B

Device Class: HID

Sampling Rate: 300ms to 65s, user adjustable

Report Rate: 1ms to 65s, user adjustable

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	Thermocouple 1	10^{-1}	K
16 Bit	Thermocouple 2	10^{-1}	K
16 Bit	Could Junction	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 Thermocouple Type

Byte#	0	1	2	3	4	5
Content	GnS	Tgt	0x01	ChP1	0x00	TYPE

GnS: 0 = Set
1 = Get

Tgt 0 = RAM
1 = Flash

ChP1 2 = Thermocouple 1 Nummer Korrekt?

3 = Thermocouple 2 Nummer Korrekt?

TYPE: 0 or 'K' = Thermocouple Type K (Factory Default)

1 or 'J' = Thermocouple Type J

2 or 'T' = Thermocouple Type T

3 or 'R' = Thermocouple Type R

3.2.4 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]

3.2.5 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]

3.2.6 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

3.2.7 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 (Current)

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					mA
I_{Stby}	Standby current	No USB activity			noch zu hoch	µA

4.2 Mechanical Dimensions

The PCB is designed to be mounted using four standard M2 screws. There are no components on the back side of the pcb, but there are through-hole components on top.

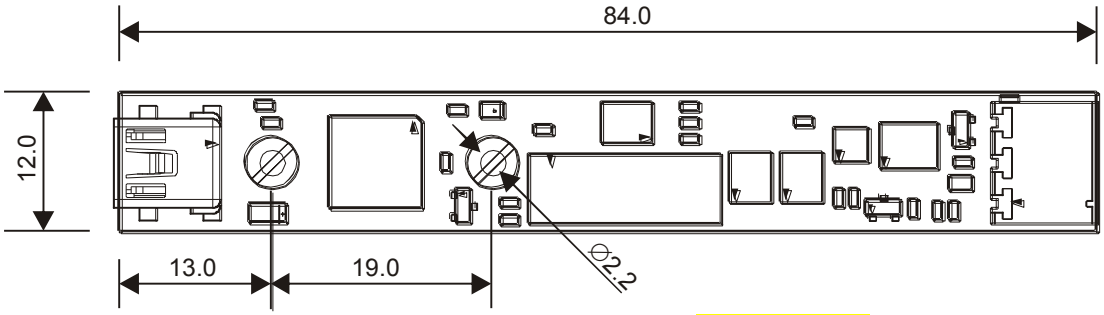


Figure: Mechanical dimensions of the Oak TC sensor Richtiges Bild

4.3 RoHS Compliance

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

Revision history

Date	Doc. Rev.	Changes
14-July-2008	Rev. 0.9	Preliminary Release

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