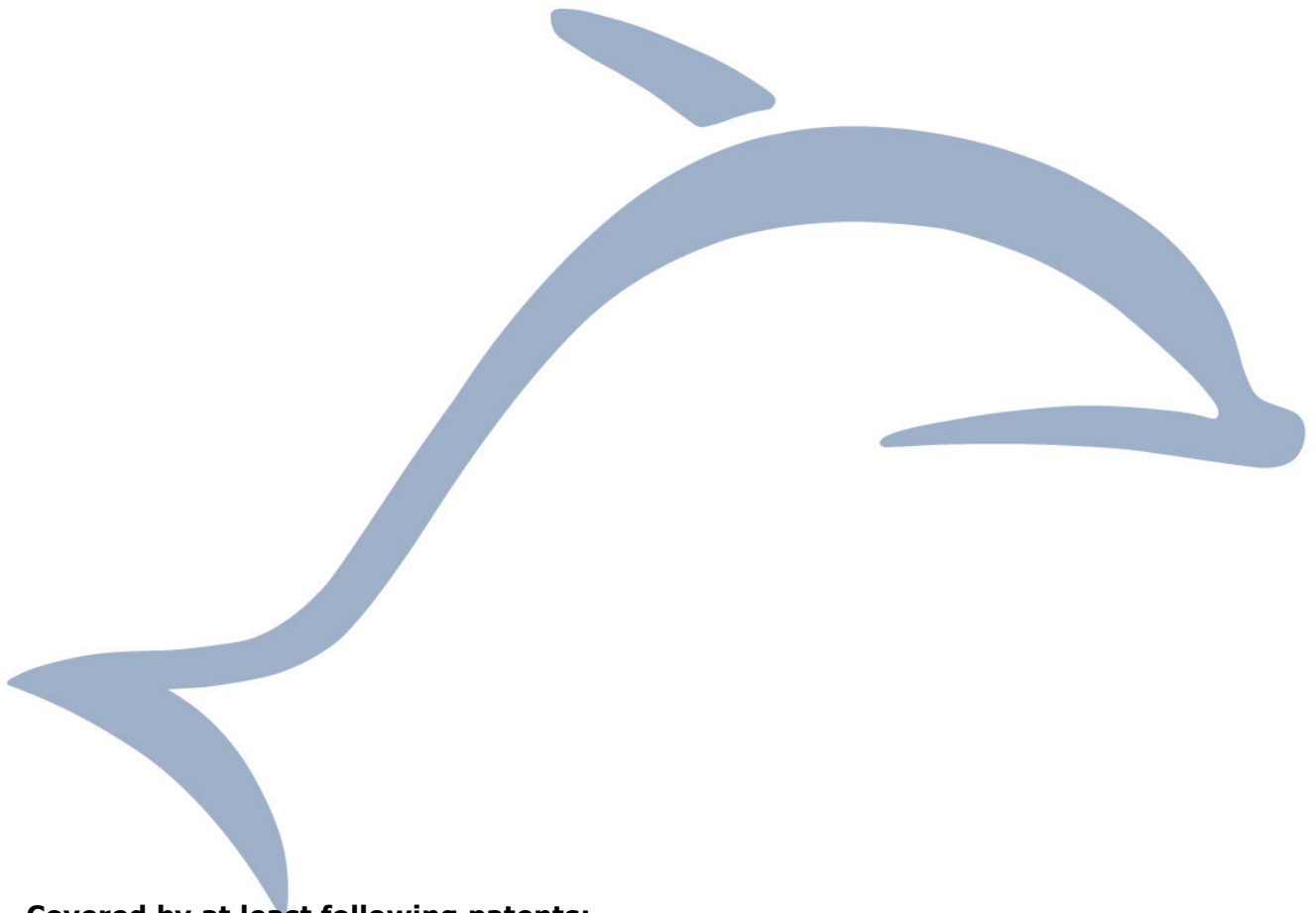Green.Smart.Wireless.
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ECT 300 Perpetuum Kit
Ultra Low Voltage DC/DC Converter
for Thermal Energy Harvesting

Covered by at least following patents:
W098/36395 | DE 10025561 | DE 10062028 | DE 10150128
DE 10155125 | DE 10063305 | DE 10301678 | DE29712270.3
W O00/043802 | DE 202004005837.5 | EP 1389358 | US 7,005,778 B2
EP 1550202 | US 7,019,241 B2 | DE 10256942.8 | DE 10256942.8 |
DE 10256940 | DE 10315765 | DE 10315765

Further patents pending:
http://www.enocean.com/en/patents/

REVISION HISTORY
The following major modifications and improvements have been made to the first version of this document:

No	Major Changes
1.0	Initial version
1.3	Updated MK

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Important notes!

This information describes the type of component and shall not be considered as assured characteristics. No responsibility is assumed for possible omissions or inaccuracies. Circuitry and specifications are subject to change without notice. For the latest product specifications, refer to the EnOcean website: http://www.enocean.com.

As far as patents or other rights of third parties are concerned, liability is only assumed for modules, not for the described applications, processes and circuits.

EnOcean does not assume responsibility for use of modules described and limits its liability to the replacement of modules determined to be defective due to workmanship. Devices or systems containing RF components must meet the essential requirements of the local legal authorities.

The modules must not be used in any relation with equipment that supports, directly or indirectly, human health or life or with applications that can result in danger for people, animals or real value.

Components of the modules are considered and should be disposed of as hazardous waste. Local government regulations are to be observed.
Packing: Please use the recycling operators known to you. By agreement we will take packing material back if it is sorted. You must bear the costs of transport. For packing material that is returned to us unsorted or that we are not obliged to accept, we shall have to invoice you for any costs incurred.

This evaluation kit and its components are intended for use for evaluation, demonstration or engineering development purposes only. It is not considered to be a finished end product fit for consumer use. Persons handling this developer kit must have electronics expertise and observe good engineering practice standards. As such, the goods being provided are not intended to be complete in terms of required design, marketing, and/or manufacturing related protective considerations, including product safety and environmental measures typically found in end products that incorporate such electronic components or circuit board. EnOcean does not reliable consequences for any HW or SW changes/modifications of the developer board done by the developer.

Observe precautions! Electrostatic sensitive devices!

TABLE OF CONTENT

1   General Description

Basic Functionality

ECT 300 Perpetuum Kit is intended to evaluate EnOcean's latest thermal energy harvester solution. ECT 300 is able to power wireless sensor nodes from only a few Kelvin temperature differentials.

ECT 300 is based on a revolutionary ultra low voltage DC/DC converter which automatically starts operation at about 20mV input voltage. Output power depends on the actual temperature difference between both sides of the Peltier element and the Peltier element being used.

ECT 300 Perpetuum Kit is designed as accessory for EnOcean's self-powered sensor developer kit EDK 300. In combination with this kit a complete thermal powered radio sensor application can be evaluated and programmed.

Typical application:

A typical thermo-driven sensor consists of a sensor element (e.g. temperature sensor), a small Peltier element, a heat sink, the new DC/DC converter and a radio module (e.g. STM300). Powered by the temperature differential STM 300 will wake up on a regular basis, e.g. every 10s, acquire sensor values and transmit them via a radio signal over a distance of up to 300m. Typical application areas are home and building automation, automated meter reading, and condition monitoring.
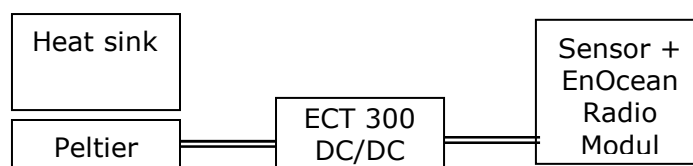
2   Content and ordering information

|	
1x ECT 300 modul	Ultra Low Voltage DC/DC Converter (Engineering Sample)
1x Peltier element with heat sink	TEC2L-15-15-5.6/73CS combined with SK 426 (Fischer Elektronik)
1x Peltier element w/o heat sink	TEC2L-15-15-5.6/73CS (EURECA)
1x Thermal compound	WLP 004 (Fischer Elektronik)

Type	Ordering Code	Frequency
ECT 300 Perpetuum Kit	**S3004-P300**	**-**

3   Technical Data

ECT 300 DC/DC converter module

Physical dimensions	20x12x5mm
Typical supply voltage V$_{IN}$	0.02V – 0.50V
Max. supply voltage V$_{IN}$	1.0V
Typical source impedance	< 2Ohm
Typical output voltage V$_{OUT}$	3.4V
Average efficiency	~30%

ECT 300 Dimensions and pin out
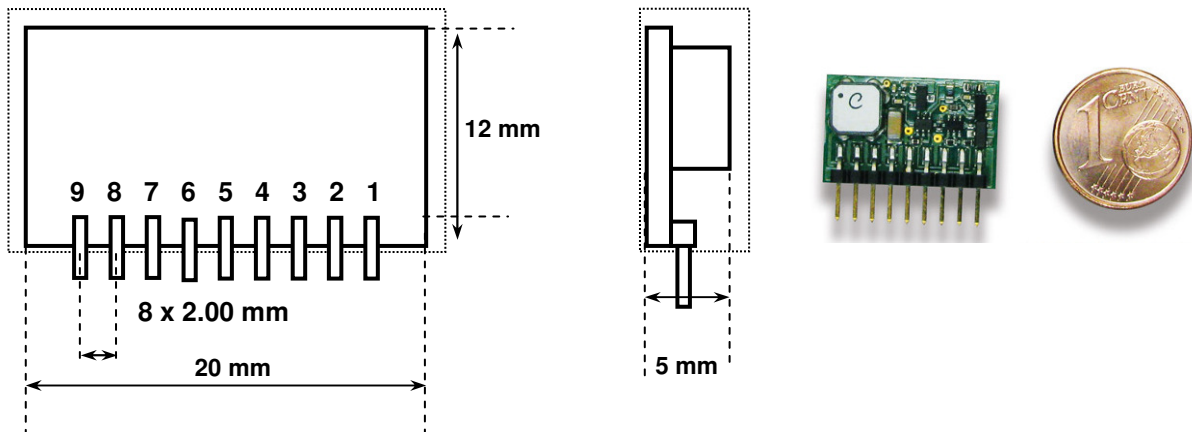
Pin	Name	Description
1	V$_{IN1}$	Voltage input 1. External generator connected to this pin
2	NC	Not connected
3	NC	Not connected
4	V$_{IN2}$	Voltage input 2. External generator connected to this pin
5	V$_{OutAC}$	AC output (for internal use only)
6	NC	Not connected
7	V$_{OUT}$	Output voltage of the power converter module
8	NC	Not connected
9	GND	Ground

Following diagram shows a typical ECT 300 performance in combination with Peltier element (TEC2L-15-15-5.6) and heat sink (SK 426). Performance will be affected by variance of components and environment (air flow etc.).
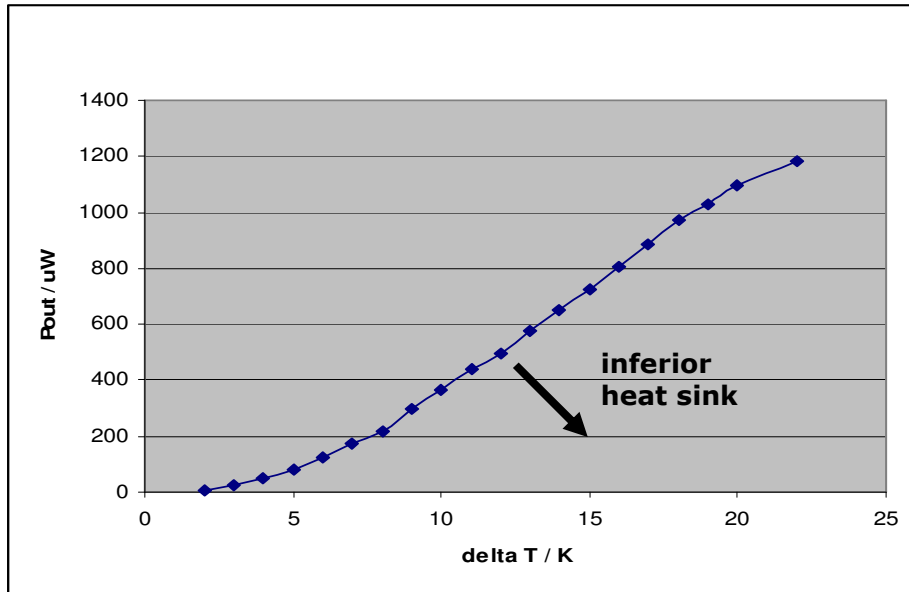
Peltier Element

Type	Eureca TEC2L-15-15-5.6/73CS
Temperature coefficient	12.5 mV/K
Internal resistance	1.44 Ω
Thermal conductivity	0.046 W/K

Heat Sink

Type	SK 426, 50mm
Thermal resistance	4.5 K/W

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4   Usage with EnOcean's EDK 300(C)

1. Configure EVA 320 according to following application example
- Temperature sensor: NTC on ADIO0
- Retransmit: every
- Wakeup: 1s
- Long term storage: EXT. (None)
- Power Converter: ECT 300 plugged
- Source: External source (Peltier connected)
- Power Management: Off (On board)
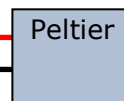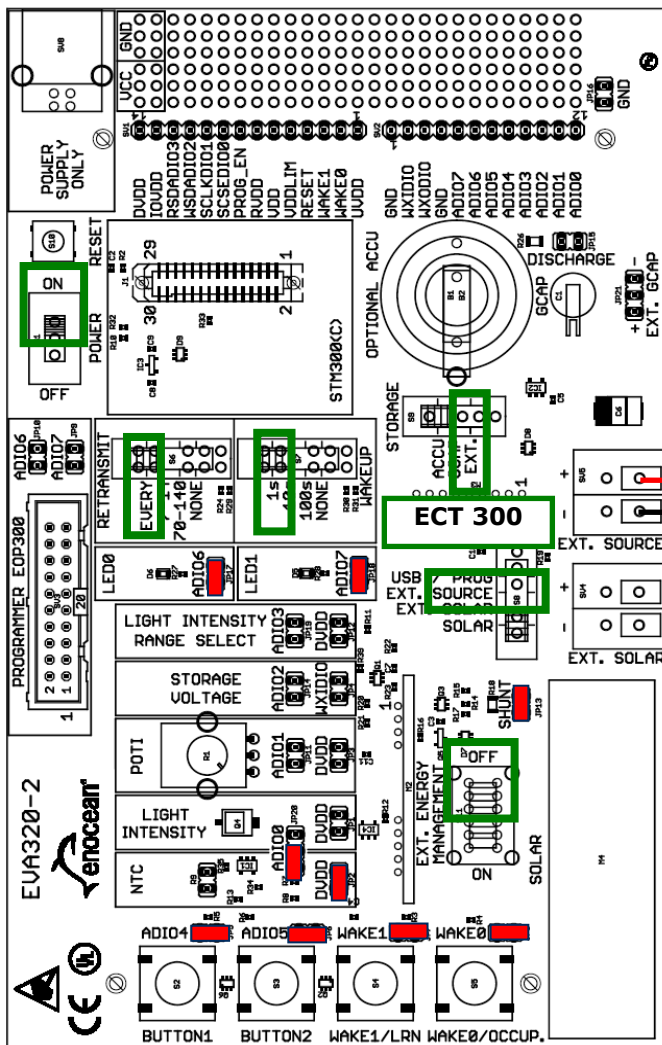
If heat sink has room temperature (e.g. 20°C) and you press one finger on the Peltier element above, the element will generate a few mV. ECT 300 will transform this to higher voltage and load short term capacitor on EVA 320. STM 300 will be powered by this energy and send telegrams.

2. Check ECT 300 output voltage via voltmeter

In order to see ramp up of CT 300 output voltage you can measure this between VDDLIM and GND. Since there is no long term storage connected (in this example) it will take some seconds until supply voltage is high enough and STM 300 will send telegrams.