

General

This application note replaces any older version. This newer version considers a reader with more transmission power.

The PE3001 can be used for temperature monitoring without a battery, supplied by the UHF field only, for certain applications. No maintenance will be required and the temperature range is not limited by environmental conditions of the battery. Although it is essential to have a permanent UHF field that supplies the circuit. The PE3001 is supplied from a charged capacitor during a measurement cycles. In non-measurement cycles the capacitor will be charged from the UHF field through the rectifier of the PE3001. Although the standard calibration allows measurements in the range of -35 °C to 67 °C, a temperature range of -40 °C to 85 °C is feasible using a different calibration (even temperatures up to 120 °C, causing acceptable lower EEPROM data retention time).

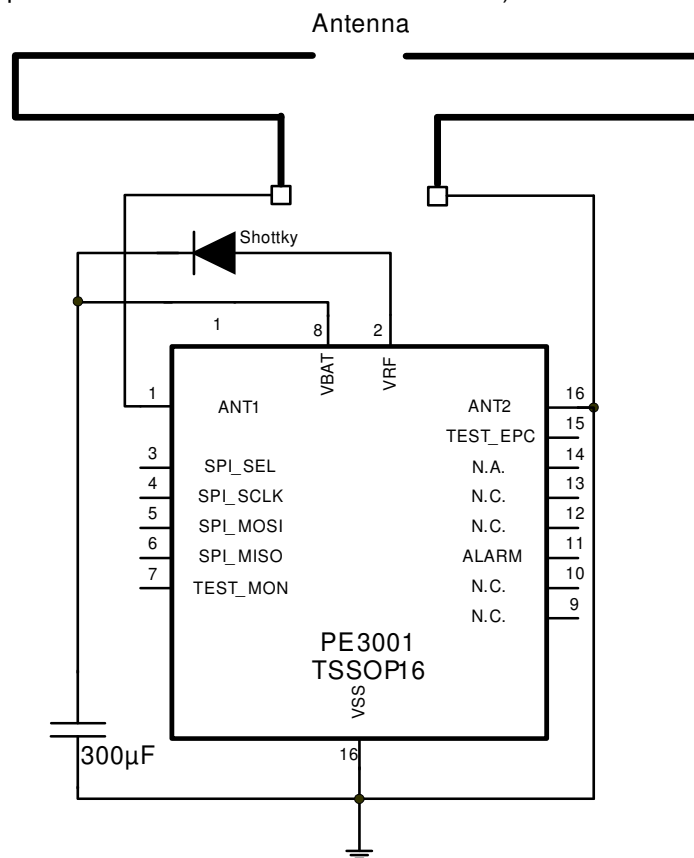


Figure 1 - Application Schematic

Application software and source codes, eagle schematic and layout database is available for evaluation and customer developments.

Parameters

The distance between the reader and the tag (PE3001) and the number of measurements per minute is depending on the reader power and chosen capacity.

Figure 3 shows the configuration. All used devices need to meet the requirements for temperature stability when used at higher temperatures. It should be possible to reach higher reading distances with more power and user specific designed antenna. Also the number of measurements can be increased with more reader power.

To get a lower voltage drop during the measurement cycle it is possible to increase the capacity. Note that only the EVA3001 V4 Evaluation kit generates enough antenna power for the chip to operate under these conditions. The PCB layout is available for download.

Table 1: Parameters FEIG MRU200 in PE lab

Parameter	Symbol	Min	Max	Unit	Comment
Reader Power	P_{UHF}		300	mW	FEIG MRU200
Number of measurements			2	1/min	
Temperature	T	-35	67	°C	Standard calibration
Distance	d	0	25	cm	Reader to Tag
Voltage drop on capacity	V_{DROP}		2	V	For capacity = 300uF (during measurement cycle)

Table 2: Parameters DEISTER UDL500 in PE lab

Parameter	Symbol	Min	Max	Unit	Comment
Reader Power	P_{UHF}		2	W	Deister UDL500*
Number of measurements			3	1/min	
Temperature	T	-35	67	°C	Standard calibration
Distance	d	5	120	cm	Reader to Tag with reflector*
Voltage drop on capacity	V_{DROP}		2	V	For capacity = 300uF (during measurement cycle)

* A distance of more than 150cm has been achieved with a FEIG LRU3500.

Reader commands

Most readers do not naturally support a continuous UHF field. They frequently go in “quiet” mode after communication sequences. Follow the sequence below when running a general measurement cycle. It is necessary to have enough time between “start monitor” and “stop monitor” to conduct a measurement (time between start and stop command should be 150ms or more).

Table 3: General sequence for monitoring

Step	Order
1	Activate permanent field
2	Configure PE3001 (set TID-Address: 0Bh and 0Ch to “0”)
3	Start measurement and wait 150ms
4	Stop measurement
5	Read out results (USER-Address: 09h)
6	Wait 2,5sek (with activated field) [depending on reader power]
7	repeat measurement at step 3

To demonstrate the function the application software for a Feig MRU200 and a Deister UDL500 reader shows a temperature measurement without a battery (Figure 4). This software does not support multi tag reading. It can be extended to do so.

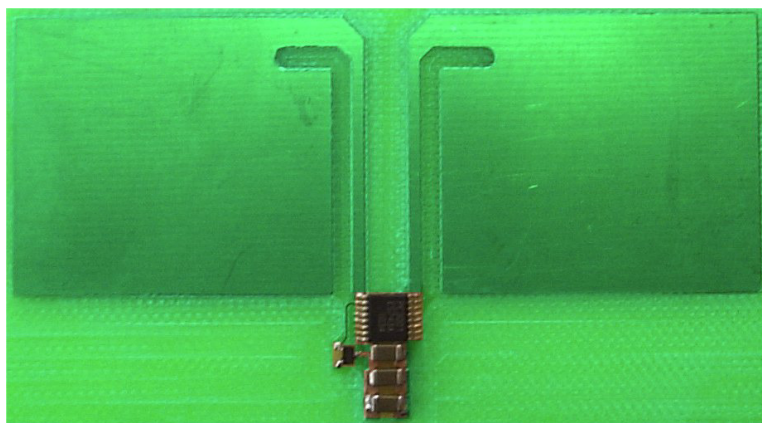


Figure 2 – Evaluation board with charge capacitors for battery-less temperature monitoring

PE3001 UHF Logger

Application Note

Wireless battery-less temperature sensing

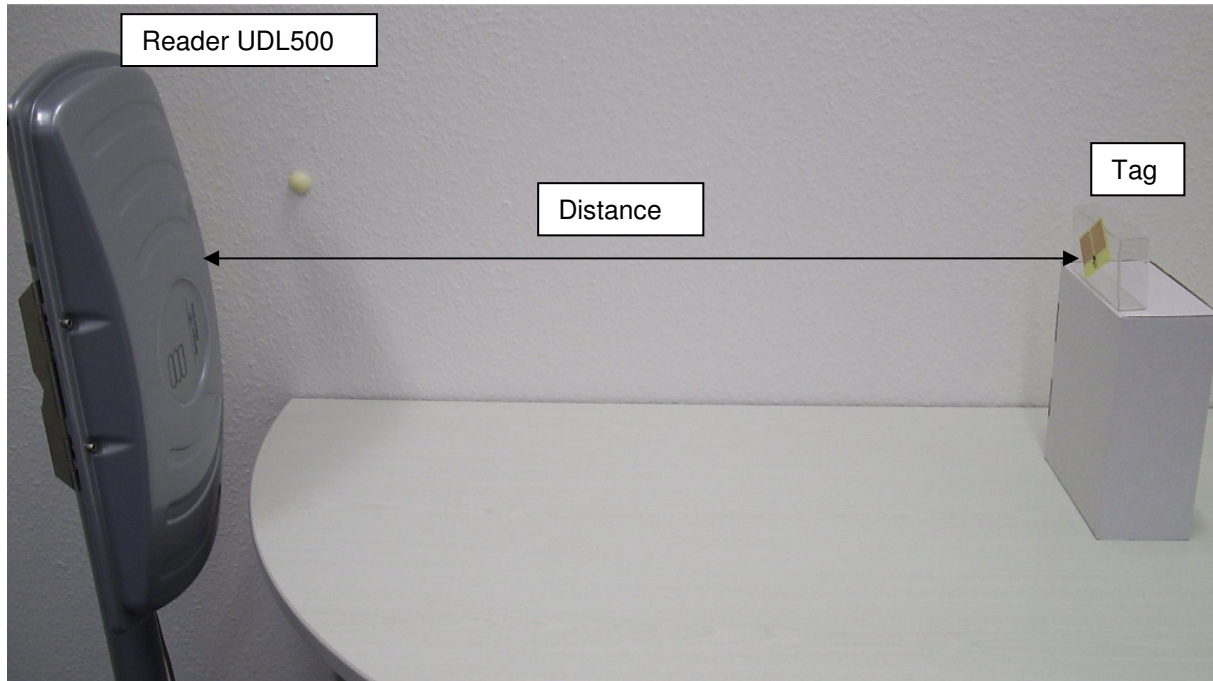


Figure 2 - Measurement Setup Configuration

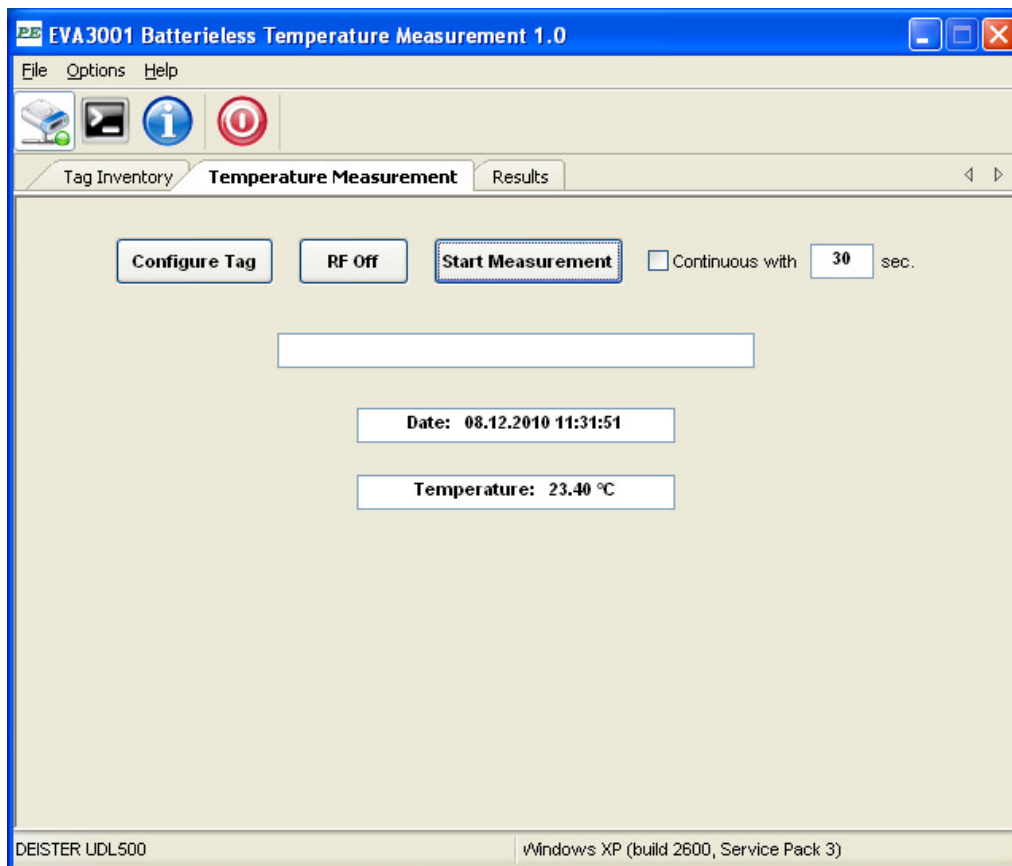


Figure 4 – Example for application software of battery-less temperature sensing

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