

## Low Power Boost Converter with Lithium-Ion Coin Cell and for Thermoelectric Energy Harvesters

### Features:

- Continuous energy harvesting with  $V_{in} > 150$  mV
- Cold start-up (battery discharged) with  $V_{in} > 330$  mV
- Integrated 120mAh Lithium-ion Coin Cell
- 97% MPPT Efficiency
- Electrical efficiency up to 93%

### Features:

The TCS-uHarvester-2V4 converter tracks the maximum power available from the thermoelectric generator(s) connected at its input. Maximum power is tracked every 16 second with high accuracy. The uHarvester-2V4 stores the electrical energy in a 4.2V Lithium and provides a regulated 2.4V output.

### Description of Operation:

In normal operation the uHarvester will start its step-up operation with input voltages as low as 100mV. The regulated output will remain active as long as the Li-Ion voltage is greater than 3.11 V (to prevent damage to the Li-ion cell). The converter stops charging the Li-Ion at 4.2 V. Operation without a Li-Ion cell is not recommended.

### ABSOLUTE MAXIMUM RATINGS

	Value		Unit
	Min	Max	
Input Voltage	0.1	5.1	V
Input Power	0	510	mW
Input Current	0	285	mA
Operating Temperature	-20	85	°C

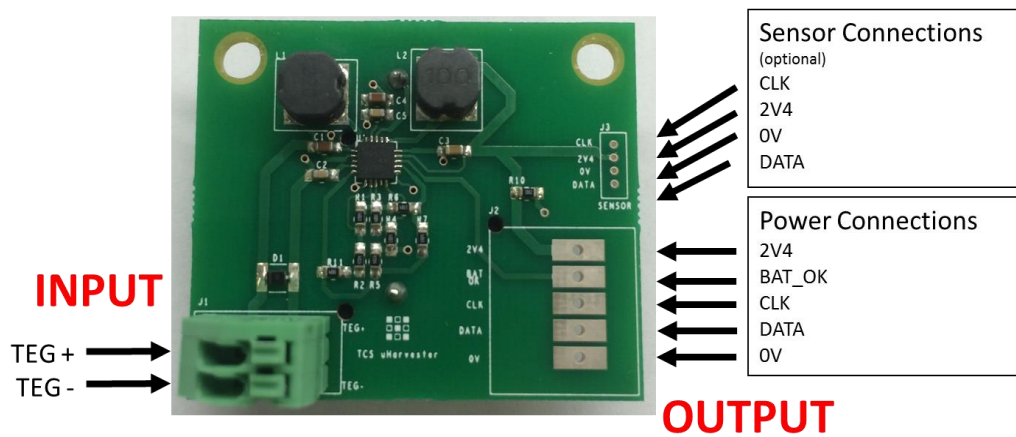
Please note that this design is based on the Texas Instruments BQ25570 controller. Please refer to the BQ25570 for further information.

## ELECTRICAL CHARACTERISTICS

Switching Frequency	500	KHz
MPPT Frequency	0.0625	Hz
Voc measurement period	234	ms
Electrical Efficiency Normal Operation	from 79 to 93	%
Electrical Efficiency Cold-start	55%	%
Output Voltage Tolerance	±10	mV
Maximum Continuous Output Power	250	mW
Absolute Maximum Output Power	440	mW
Maximum Peak Output Current	185	mA

## CONNECTIONS:

The TEG input and the output shall be connected as shown below. The output is isolated from the input, i.e. TEG- is connected not to 0V



## TYPICAL CHARACTERISTICS:

### MPPT and Electrical Efficiency:

These results show the accuracy of the converter in setting the at-load operating voltage at half of the open-circuit, and the electrical efficiency. The operation of the thermoelectric generator is replicated using a power supply in series with a resistor.

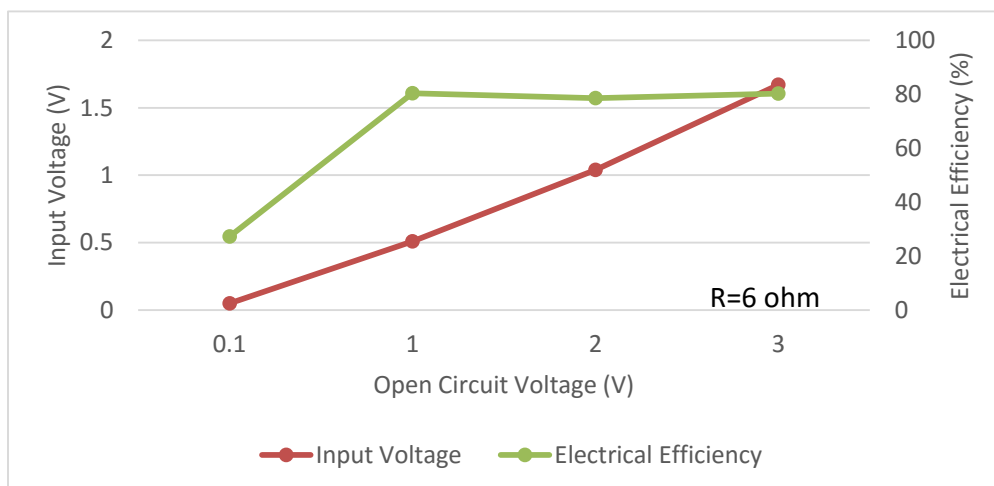


Figure 1: Voc vs. Input voltage and electrical efficiency for Rte=6 ohms

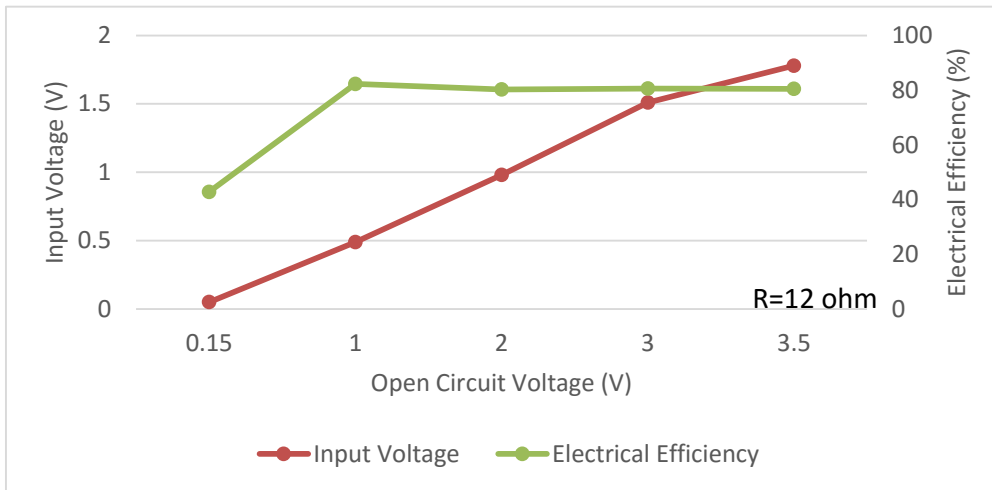


Figure 2: Voc vs. Input voltage and electrical efficiency for Rte=12 ohms

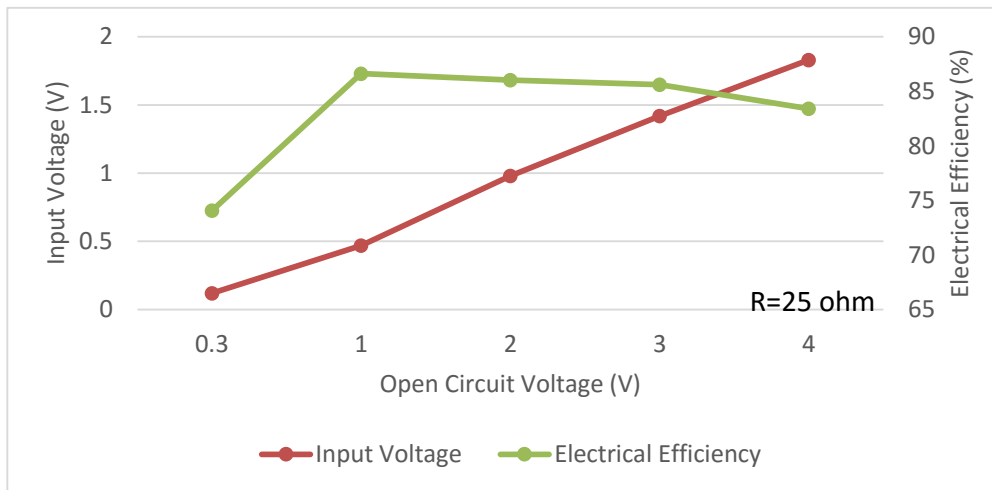


Figure 3: Voc vs. Input voltage and electrical efficiency for Rte=25 ohms

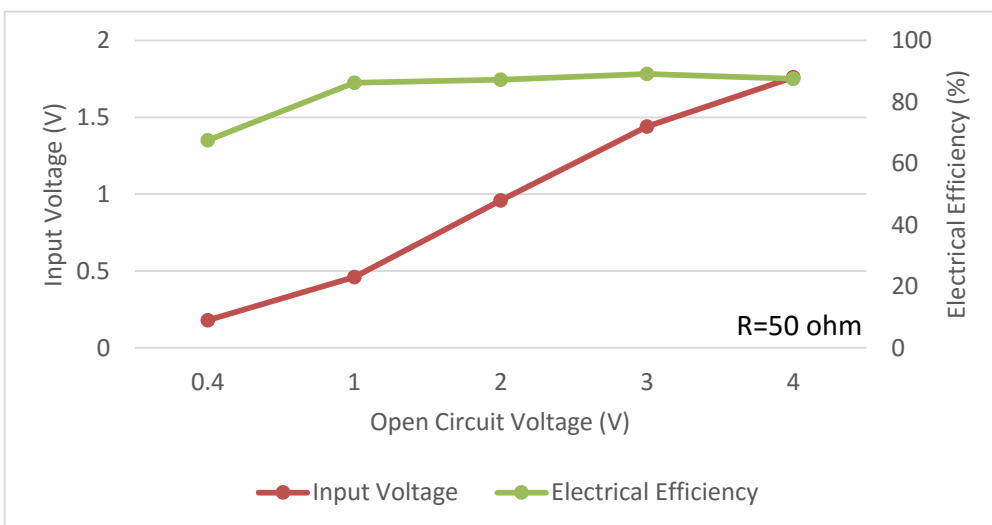


Figure 4: Voc vs. Input voltage and electrical efficiency for Rte=50 ohms

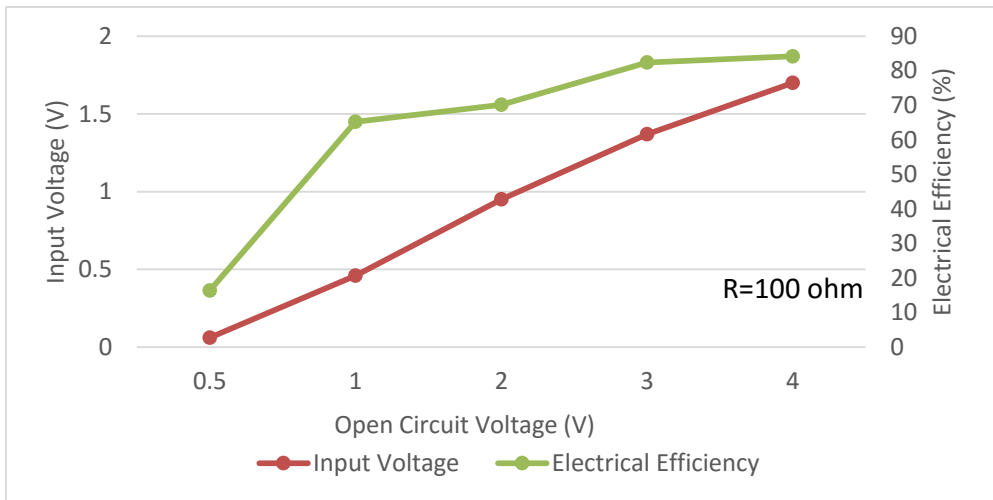
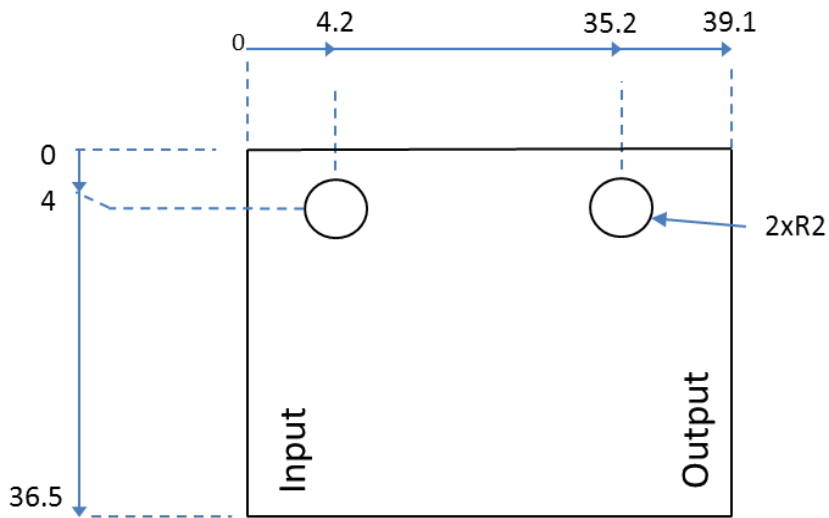


Figure 5: Voc vs. Input voltage and electrical efficiency for Rte=100 ohms

**Product Dimensions:**



All dimensions in mm  $\pm 0.5$

*Thermoelectric Conversion Systems (TCS) Ltd. does not assume any responsibility for use of any circuit described, no circuit patent licenses are implied and TCS Ltd. reserves the right at any time without notice to change said circuitry and specifications.*

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This TCS Ltd product is not authorised for use as critical component in life support devices.

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