Datasheet

MODEL C

A unique vibration energy harvesting evaluation kit for your every need. Including power management and sensor functionality with BLE communication. Factory tuned resonance frequency ranging from 9-32Hz

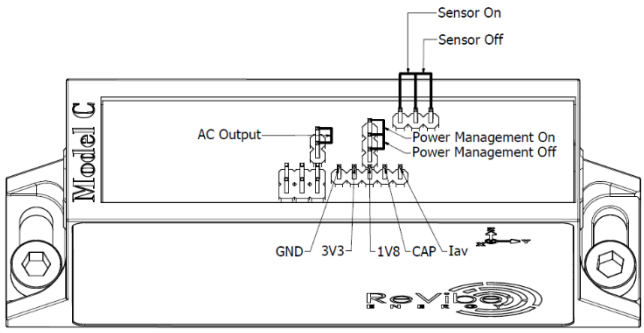
Features

- Low frequency vibration energy harvester
  - Available in a range of different resonance frequencies
  - Patented dual spring system design
  - High power to weight ratio
- Highly efficient DC/DC power management control
  - Buck/boost to manage charging of battery/capacitor with varying input voltage
  - MPPT (Maximum power point tracking) to extract energy as efficiently as possible in different vibration conditions
  - Regulated output voltages 1.8V and 3.3V to power your own sensor projects
- Integrated sensors and wireless communication
  - Ultra-low power 3 axis accelerometer
  - Temperature sensor
  - BLE (Bluetooth Low Energy) communication
  - Custom DC power analyzer which continuously measures the charge power generated from the harvester and transmits this information with BLE
- Easy-to-use mobile application to visualize and analyze sensor data
  - Automatically collects BLE data sent from the harvester
  - Can store the data locally and visualize the data in graphs

Description

There are three modes available on the evaluation board. These are easily controlled with switches on the PCB. **Mode 1** is pure AC extraction which allows the user to use the available energy by connecting its own electronics directly to the AC source. **Mode 2** supplies a regulated DC voltage which can be used to power various low power applications. Available output voltages are 3.3 and 1.8 Volt. **Mode 3** is a complete sensor node powered through vibration energy. The sensor will use the available energy to measure acceleration, temperature, and DC charge power. It will send this data to a receiving device over BLE where the data is plotted.

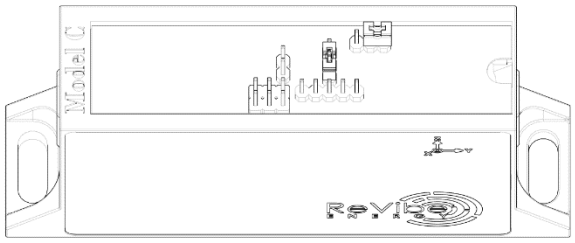
Evaluation board interface



Modes of operation

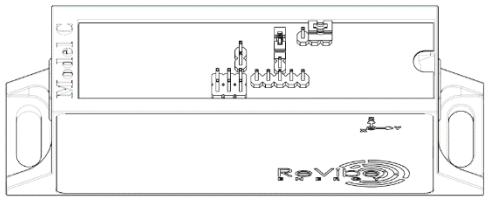
Mode 1 - AC

This mode allows the user to access the unregulated AC output from the Model C and use the energy for its own development projects. Connect the test cables to the AC output pins and ensure the Power Management and Sensor is switched Off.



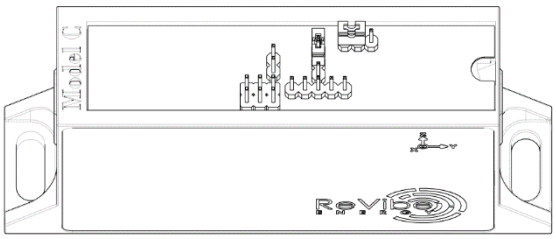
Mode 2 - DC

This mode enables the harvester to supply an external electronic circuit with a regulated DC voltage. Connect the external circuit to the GND and 1V8 or 3V3 pin, depending on which output voltage is preferred. Ensure that the Power Management is switched on and that the Sensor node is switched off.



Mode 3 – Sensor node

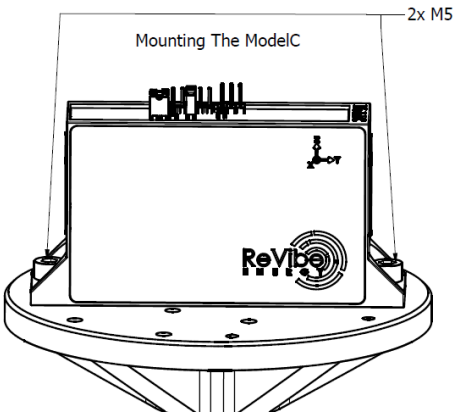
This mode allows the user to evaluate the Model C as a complete sensor node which measures acceleration, temperature and the power generated in the harvester. This data is transmitted over BLE and can be viewed using the Android application VibView. Make sure the Power Management is switched on and that Mode 3 is switched on.

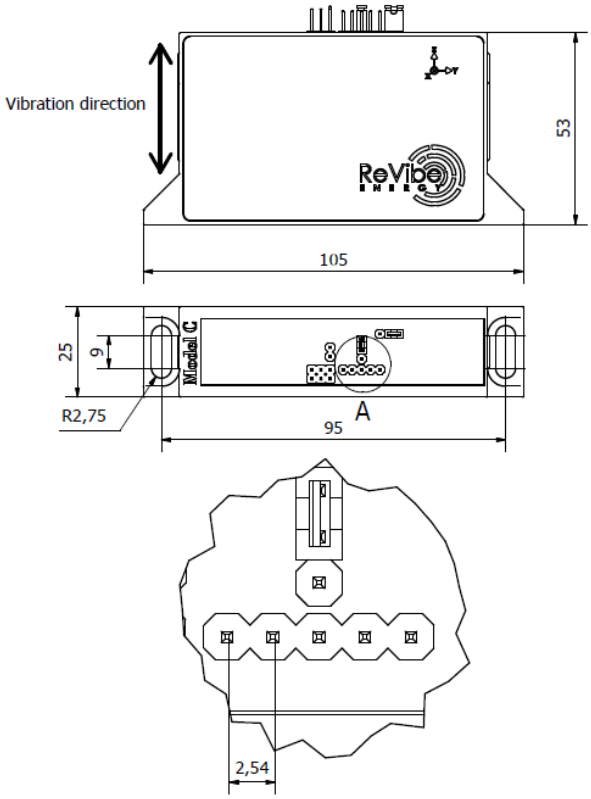


Mechanical interface

Mounting

The Model C should be mounted in the vibration direction shown on the drawing. The preferable mounting method is to use the slots and mount it with M5 screws. The slots can also be used to attach magnets with if a magnetic mount interface is preferred. If it is not possible to use the screws, and magnets are not an option, double sided tape can be used. This mounting method is not recommended for high-amplitude vibrations (>1g).

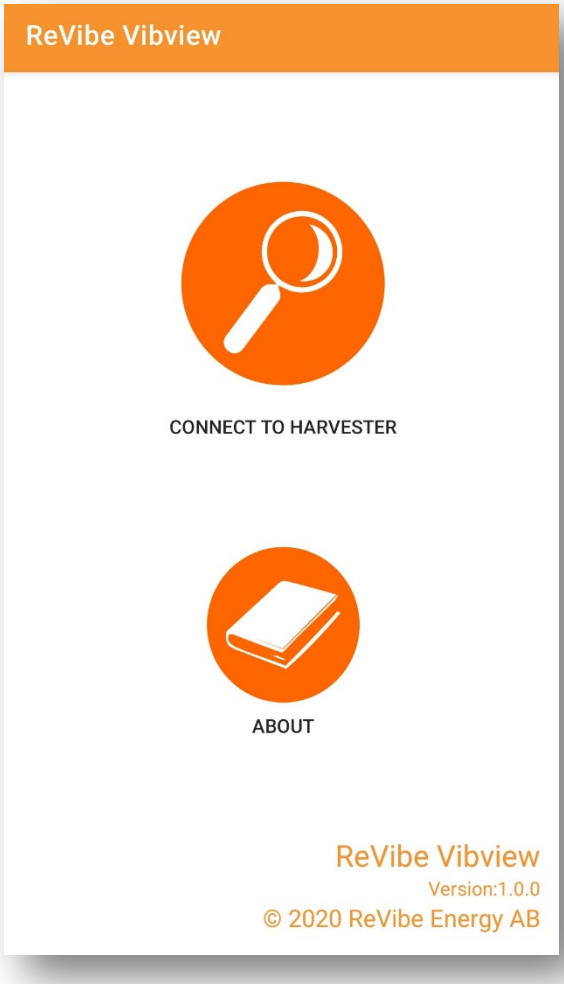




VibView

When Model C is used as a sensor node the sensor data is transmitted using BLE and can be received and viewed in the VibView application available on Google Play.

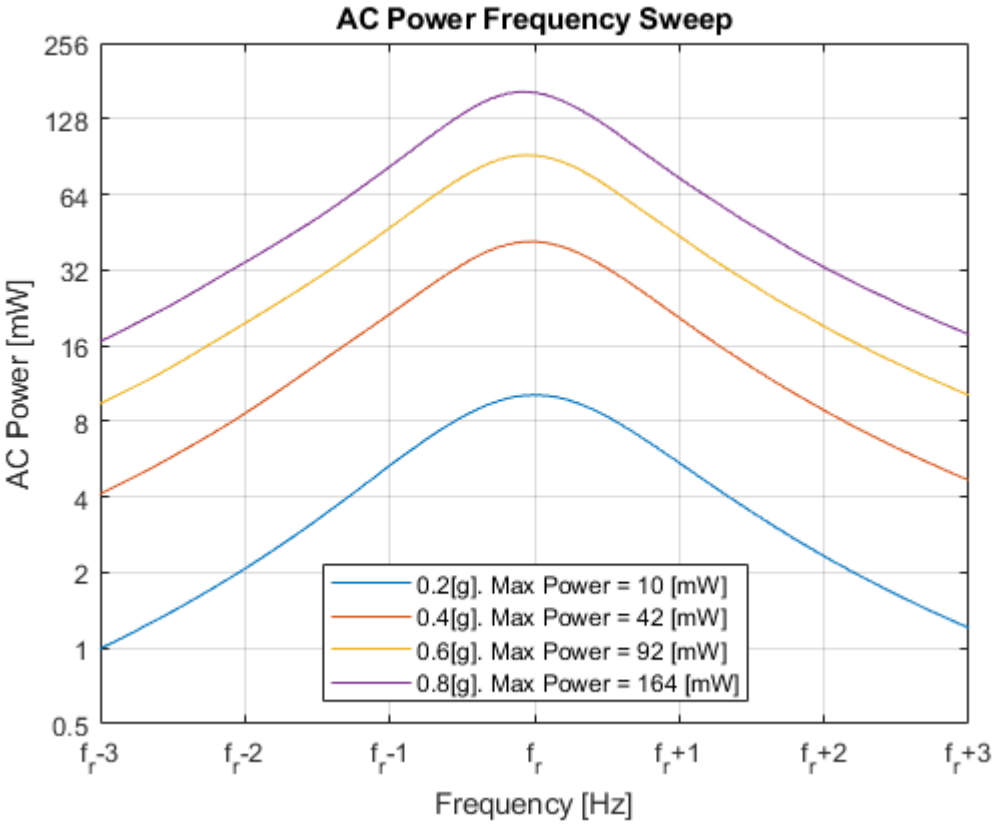
Scan the QR code or search for it on Google Play to download the application.



Specifications

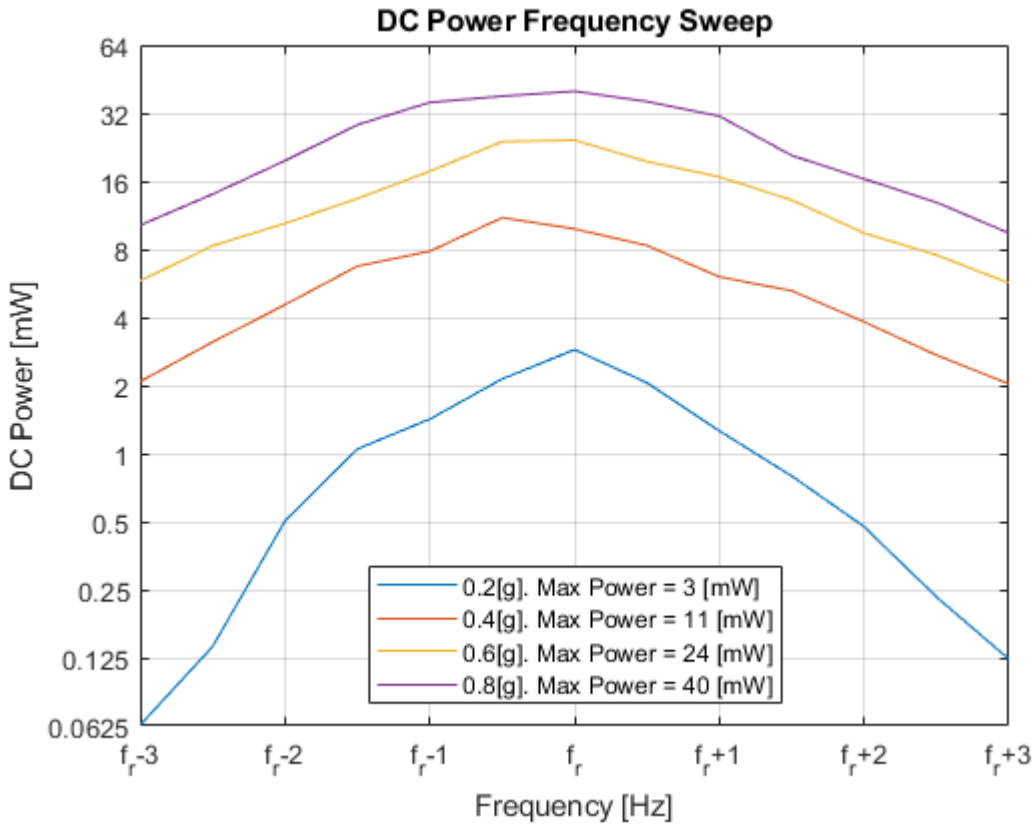
Electrical	
Coil resistance	300 Ω
Regulated DC output	1.8 V, 3.3 V
Energy storage	1 mF
Power management IC	STM SPV1050
Sensor	
Wireless protocol	BLE (Bluetooth Low Energy)
Accelerometer	STM LIS3DH
BLE module	STM BLUENRG-M2SP
Microcontroller	STM32L476RGT6TR
Power consumption sensor off (Mode 2)	225 µA
Power consumption sensor on (Mode 3)	1.6 mA
Minimum input acceleration (Typical)	0.25 g
Physical	
Device mass	147.5 g (±17.5 g depending on frequency tuning)
Dimensions	105 mm x 25 mm x 60 mm
Housing material	PA12
Connector	0.1” Pin header interface
Mounting screw size	M5
Environmental	
Operating temperature	-20 °C – +65 °C
Shock limit	100 g during 5ms
Maximum in-band vibration	2 g

Mode 1: Typical generated AC power



Measured on a Model C, tuned at 32Hz with R_{Load}=1000Ω

Mode 2: Typical generated DC-Power



Measured on Model C tuned at 32Hz