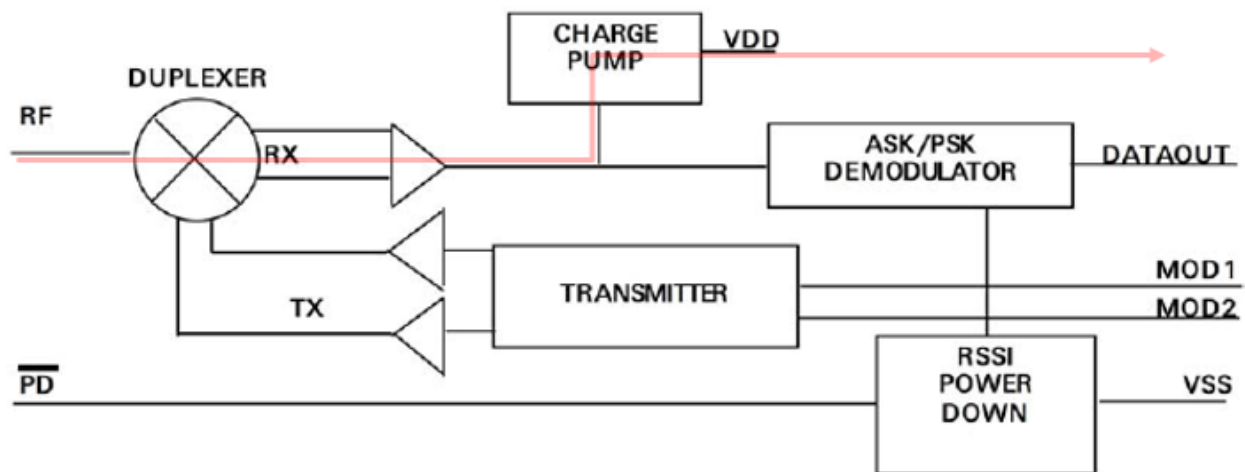


Energy Harvesting Using the MSRFIF

Energy harvesting is taking energy that exists in the environment and converting it to power. The most common forms of energy that are harvested consists of solar power, wind power and hydroelectric power. Power can also be harvested from radio frequencies or vibrations. This application note describes how the MSRFIF Radio Frequency Front End IC can be used to harvest energy from radio frequencies or vibrations.

MSRFIF Block Diagram

The block diagram for the MSRFIF is shown below. The primary path used in the energy harvesting application is from the RF input to the VDD output as highlighted below in the internal block diagram of the MSRFIF.



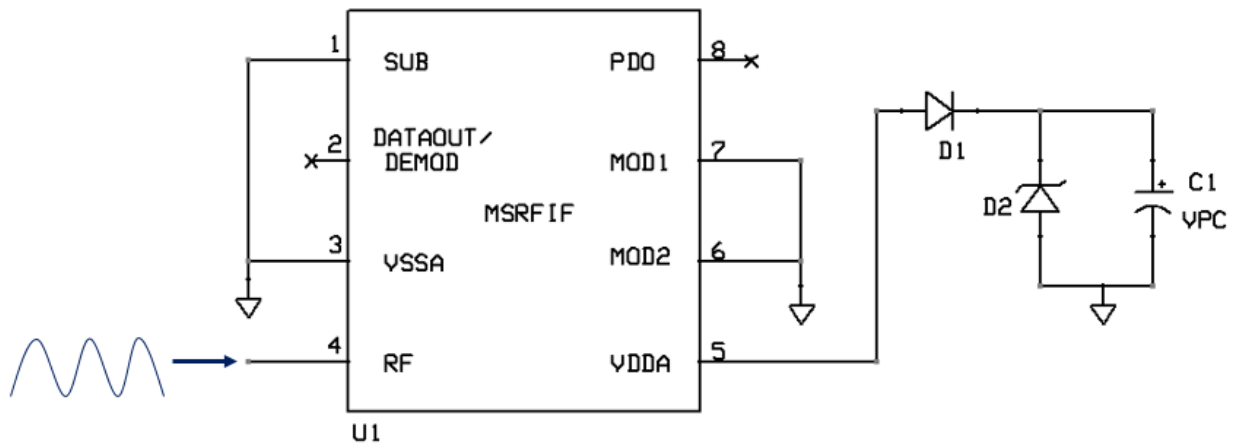
The MSRFIF can accept a 50Hz to 250MHz RF signal at the RF input which is then converted to a DC voltage via the internal charge pump. The DC level of the VDD output pin will range from 2.4V to 4V (200uA typical) when a valid signal is present on the RF input. Some examples of potential sources connected to the RF input pin are Piezoelectric devices, transducers, and any other device that can convert energy from vibrations or motion to an electrical signal.

The MSRFIF also has an ASK/PSK demodulator, but that function is typically not used in an energy harvesting application. Additional details for the ASK/PSK demodulator are available in the MSRFIF datasheet.

MSRFIF Application Example

The application circuit below shows the interface of the MSRFIF with a Vinatech VPC supercapacitor. The MSRFIF generates a voltage on the VDDA output to trickle charge the Vinatech VPC series supercapacitor. The VPC supercapacitor can be charged with a voltage between 2.5V and 3.8V.

The application requires minimal external components. A diode (D1) may be needed on the VDDA output to prevent any leakage current on the VDDA pin to drain the VPC supercapacitor. The other external component is a 3.8V Zener diode (D2) to ensure that the maximum voltage to the VPC supercapacitor is 3.8V.



The signals related to the ASK/PSK demodulator are not used. The unused inputs are tied to GND (to minimize noise and power) and the unused outputs can be left floating.

Summary

Harvesting energy from the vibrations or radio frequencies that exist in the environment and converting it to power is possible with the MSRFIF Radio Frequency Front End IC. The MSRFIF is an ideal solution for applications where on-board components require less than 4V and 200uA.